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LCD Video Projector

NDD

FEBRUARY 1999

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Home Theatre: What DO you need?

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CPLD-based digital
Trigger Adaptor MkII
for Scopes

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**Hewlett-Packard
Infinium 500MHz Scope
worth over \$20,800!**

Which home Theatre system?

David Stratton considers his next cinema choice

"When Onkyo asked me what I'd like in my next home theatre receiver I was hard pressed to think of any extra features I didn't already have in my trusty Onkyo 939.

"What really impressed me was their snappy new DVD player with dual laser systems for video and audio. Very nice indeed.

"But then they showed me their two latest

receivers... the TX-DS656 and 555. Wow! 85 or 70

watts for all 5 channels, in-built Dolby Digital, fabulous

Digital signal processing functions, smart remote, Lucasfilm's Cinema EQ and more.

"And at these prices I'll seriously have to think about putting one into the holiday house so I can still see movies even when I'm on holidays."



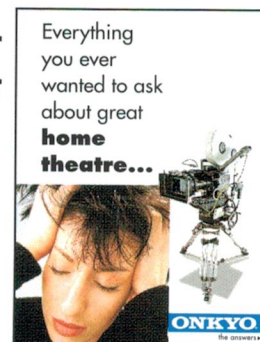
DV-S501 DVD/CD Player

David Stratton

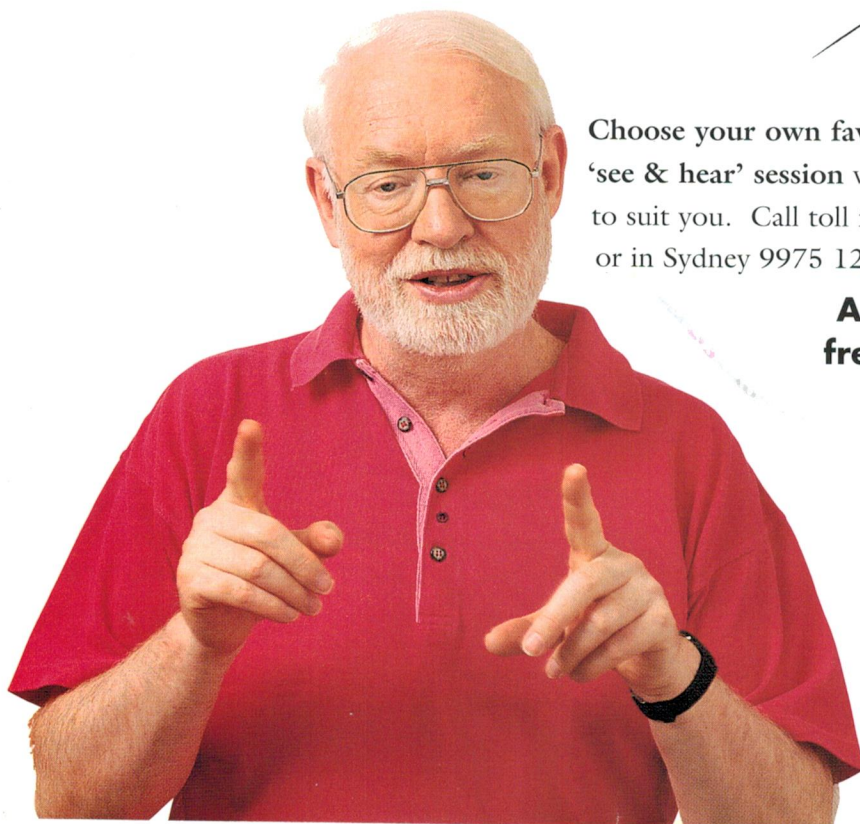
David Stratton Film Critic -
The Movie Show, The Australian, Variety.

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February 1999 Volume 61, No. 2 www.electronicsaustralia.com.au

World of Electronics

- 6 What's New *New Swatch shows 'Internet Time'; HP's Jornada baby PC*
- 10 The Challis Report *Sony's new VPL-S600M Data & Video Projector*
- 14 Home Theatre Without Fears *What you do really need, and why...*
- 26 Focus on Technology at 'Slow' Fall Comdex *Paul Swart reports*
- 62 Moffat's Madhouse *Flying toys, for bigger boys...*
- 64 Index for Volume 60 *The articles we published in 1998*
- 66 Vintage Radio *The Ultra-audio and/or Marnikay receiver*

Projects and Technical

- 35 Serviceman *Who says miniature equipment isn't reliable?*
- 42 Circuit & Design Ideas *Current control for steppers; ring simulator*
- 44 Putting a CPLD to Work - 2 *At last, the Digital Trigger Adaptor Mk2*
- 50 \$10 Wonders *20 — A Novelty Nightlight*
- 56 Receiver for the VNG Clock - 2 *Construction, testing & alignment*
- 60 Computer Clinic *Dual-booting Linux, part 2*

Columns and Comments

- 4 Letters to the Editor *Colour blindness, Big Pond Cable service, more*
- 5 Editorial Viewpoint *DVD video: the Region 4 goose may not lay eggs*
- 32 Forum *Cellphone health risks: an interesting court case ends in the UK*
- 69 Information Centre *Free energy, NiCad charging and deep cycling*

Departments

- | | |
|---------------------------|---------------------------|
| 72 EA Marketplace | 97 Webwatch |
| 73 Book Reviews | 98 Directory of Suppliers |
| 74 EA History, Crossword | 98 Advertisers Index |
| 82 EA Subscriptions Offer | - Notes & Errata |

On the cover

Perhaps few of us will have the budget to achieve this kind of impact from our home theatre setup, but we thought this excellent artist's impression would at least start you thinking about the benefits of home theatre. (Courtesy Panasonic Australia) Our feature article on home theatre starts on page 14.



Sony makes big pictures



10 Sony's new VPL-S600M video & data projector gives bright 800 x 600 pixel images — great for the big picture...

Only at Comdex, it seems



26 Where else would a firm be able to get thousands of people to wear crazy hats advertising their product?

CPLD-based project



44 After a few design hiccups, Graham Cattley has finally been able to finish his Trigger Adapter Mk2, based on a Vantis M4 32/32 CPLD...

Professional Electronics

- 76 News Highlights *Tektronix reduces the cost of its DPO technology*
- 79 Cooma's Fount of Service Manuals *High Country Service Data*
- 80 Solid State Update *Miniature op-amps feature micropower operation*
- 84 New Products *Lower cost DMMs from Fluke; compact 3GHz counter*
- 86 Monitor Tester & IR Thermometer *New instruments from Obiat*
- 88 Silicon Valley Newsletter *AOL-Netscape-Sun alliance is 'giant killer'*
- 90 Sound Forge XP4, Cool Edit 96 *Audio file editing programs*
- 93 Modular Surge Protection System *The Panamax Max6 system*
- 94 Computer News & New Products *Tiny 6.5GB HDD for notebook PCs*

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Letters to the Editor

Colour blindness

Phil Allison's letter in the October issue reminded me of something that made me laugh the other day. It was an item on TV about lenses that helped the colour blind. One of the people featured in the item said he had wanted to be a pilot, but they wouldn't let him because he was colour blind, so he became an electrician instead!

Gordon Drennan, Ultimo NSW

30-bit SIMMs

Your correspondent Kevin Shackleton, in EA Dec 1998, appears confused about the number of eight-bit 30-pin SIMMs required for various models of PC.

The 286 and 386SX have 16-bit external busses and require multiples of 2 x eight-bit 30-pin SIMMs. The 386DX and 486 have 32-bit busses and require multiples of 4 x eight-bit 30-pin SIMMs.

Dominic Toon, Auckland NZ (by e-mail)

Big Pond Cable service

Re your October Editorial Viewpoint 'Wideband data comms: clearing the bottleneck'. You mention the high speed Internet access service provided by Telstra, with some comments regarding technical problems.

I'd like to assure your readers that Telstra's Big Pond Cable service is well worth considering by all those who are tired of the 'World Wide Wait'. Yes, you are correct that there were some technical limitations inherent in the security provided by a firewall; this firewall was removed at users' request early this year. Any Internet application using TCP/IP may be used.

The system includes a proxy server for the benefit of users; use of the proxy is optional (depending on browser configuration by the user). Many further improvements to the service, including the provision of web and domain hosting, have improved the speed and stability of the service.

Your comment regarding degradation of speed due to the shared media nature of HFC is technically correct, but is not the case with Big Pond Cable, where Telstra have been consistently upgrading the HFC and headend infrastructure as the service grows.

There are very few high speed Internet

access services available on a scale and quality of Big Pond Cable anywhere in the world. Even in North America the overall systems tend to be smaller in terms of coverage area.

Telstra and their suppliers (Motorola and Hewlett-Packard) should be commended on their ability to provide this service. The Big Pond Cable project has been recognised by The Institution of Engineers, Australia (IEAust) with a high commendation at the 1997 Engineering Excellence Awards. (Further information is available at <http://bigpond.com/cable/>)

Scott Sutherland, Hewlett-Packard Australia

40 years on

On receiving the December issue of EA, it occurred to me that it is now 40 years that I have been receiving EA and its predecessor *Radio TV & Hobbies*. It was in December 1958, when I was still in primary school, that I purchased my first regular copy and I haven't missed an issue since. I would like to thank you for the wealth of interest and information that you have provided and continue to provide.

I look forward to receiving EA on into the future. Who could have imagined in 1958 that I could communicate with you using a computer and e-mail!

Bill Adams, St. Lucia Qld (by e-mail)

Wants old magazines

I wonder if anyone can help. I collect old electronics magazines, and I'm missing the following early copies of *Radio & Hobbies*:

1939 — Any issues, with covers (I have some, but in a poor state);

1940 — Any except March and October;

1941 — January, February, April, May, June, July and August;

1944 — May.

I'm also interested in any copies of *Wireless Weekly*; I don't have any of these at all. By the way I need complete copies with covers, in good condition.

Colin Leonelli, 14 Herbert St, Ingham Qld 4850.

Easier way...

You put out an excellent magazine in EA; keep up the good work.

I'm in touch about the Infra Red tester mentioned in the November 98 issue. An easier way to test these devices is to

Editorial Viewpoint

point the IR controller into the lens of a video camera. The pulsating light is clearly visible with either a B/W or colour viewfinder.

John Wekking, ECNZ Southern Gen. (by e-mail)

Fatuous warning?

I refer to the 'Scope safety warning' that was published in the Letters column of your January 1999 issue.

As a matter of urgency Emona, as the Australian agent for the brand concerned, contacted the author of the warning to investigate the phenomenon that he encountered. From the anonymity of his e-mail response, we discovered that the author had omitted much more than he had included in his letter to the Editor.

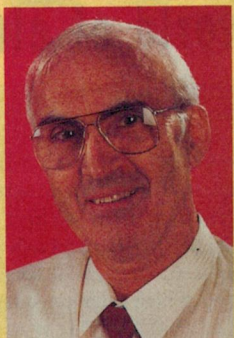
I draw the Editor's attention to the following points:

1. The author described a phenomenon, however he had omitted any mention in his letter that by spraying CRC 2-26 he had in fact resolved the problem.
2. At no time did the author of the warning make any attempt to contact the importer or the manufacturer of the scope model that he described.
3. The scope highlighted is a 5MHz analog scope that was purchased by the author second hand, at least 10 years ago. The serial number confirms its manufacture in 1981.
4. While the author was familiar with the vintage and background history of the instrument, he did not use these facts to qualify his observations in any way. By disclosing these facts the company feels the scale of the warning would have been more accurately and truthfully conveyed.

All of the manufacturer's current oscilloscopes are CE marked and meet the latest European LVD requirements. Our company recognises its obligations and responsibilities and ensures as a matter of policy that all products sold by the company not only meet published specifications, but exceed the highest electrical standards.

Mark Breznik, Emona Instruments. ♦

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.



DVD video: the Region 4 goose may be too sick to lay any eggs...

WHILE I WAS writing the article on home theatre systems for this month's issue, I was also able to borrow and try out the new Sony VPL-S600M video projector, after Louis Challis had reviewed it (also for this issue — see page 10). Sony very kindly also sent us one of their DVP-S715 DVD players, to use as a source of high quality digital video and audio, plus a sample DVD movie.

If I needed any further convincing about the appeal of home theatre, or the importance of DVD as a medium for it, this certainly provided it. There's no doubt that a large picture really adds to the impact and entertainment appeal

of many movies — after all, most movies have been consciously made to be seen on a big screen. And the fact is that popular though they've become, VHS videotapes really don't provide sufficient image and sound quality to bear this kind of enlargement. It's only when you see the crisper, cleaner and more stable images from DVD — and hear the impact of multi-channel Dolby Digital sound — that you start to realise not only the real potential of home theatre, but the importance of DVD as a key part of it.

Of course for the time being at least, only a lucky few Australian consumers will be able to afford an LCD video projector,

back-projection or plasma panel set, to achieve really large images. They're still very expensive, in anyone's language. Happily you can still get quite a lot of impact in many lounge rooms from a modern TV set with a screen of 68cm or so.

What I see as a much more serious hurdle, for most of us here in Australia, is the pathetically small number of movies that have actually been released here on DVD as yet — so small as to discourage all but the most optimistic and far-sighted consumers from buying a player, surely. As I write this a few days before Christmas, there still seems to be only a couple of dozen titles available — perhaps 10 more than there were back in the middle of the year, when I last complained about this problem.

Frankly, I don't think there's any doubt that the main reason for this shortage is the decision by the world's movie production companies to hobble DVD video discs with the regional coding system. It's the reason why we're going to get movies on DVD here *later* than in most other developed countries, and it's also the main reason why we may *never* see many of them here on DVD at all.

The regional coding system is of course designed to maximise the profits of the movie producers, by giving them almost total control over the releasing of movies on DVD in each region. Which is all very well, providing you're not too worried about the rights of we consumers. But it also creates a problem for the producers themselves, because they have to produce essentially customised discs for each region.

Not surprisingly, they're currently putting most of their efforts into cranking out DVDs for the bigger and more lucrative market regions. We poor sods in 'also ran' Region 4 are expected to be happy with the few they throw our way, and wait until they've made enough hay to bother producing more for us. But will they bother to do this with *all* the titles we'd like to be able to see properly, in our home theatres?

I still think there's a serious risk that many people will be so turned off by all this that they'll simply ignore DVD and its technical benefits, just as they did with laserdiscs. So in Region 4, the DVD video goose may never muster the strength to lay golden eggs for anyone — and we'll all be the poorer for it...

Jim Rowe

WHAT'S *new*

in the ever-changing world of electronics

Canon digital camcorder offers DV in/out

Canon Australia has introduced the DM-MV10i, a MiniDV digital camcorder claimed to offer all of the features needed to produce exceptional digital videos. It incorporates a 16x optical/64x digital zoom, a new compact optical image stabiliser to eliminate camera shake, DV in/out interface, built-in editing, a high resolution flip-out LCD screen and a 'palmcorder' design.

Camera shake, a common problem with high ratio zooms, is virtually eliminated with Canon's new shift-type optical image stabiliser (OIS). Built into the lens, it allows part of the optical system to shift in relation to the optical axis in real time, which redirects the light path through the lens and maintains a

stable image on the CCD. Because it is light-weight and compact, it allows the lens barrel to have a radius 20% less than is required in similar systems. The lens configuration is 11 elements in 9 groups. An aspherical lens is used in the OIS group, which enhances image quality.

The camcorder's built-in DV terminal (IEEE 1394) enables it to download still images to PC via the optional Canon DK-1 (V1.1) Digital Capture Kit. In addition, video editing on a computer or digital editing equipment, followed by transfer back to DV tape, is possible using the DV input capability of the DM-MV10i.

The DM-MV10i is available from autho-



riser Canon photographic and video retailers. It has an RRP of \$3299 (\$2499 tax free). For more information circle 141 on the reader service card or call Canon on 1800 816 001.

Cordless phone can have many handsets

Panasonic has updated its cordless phone range with two new models, the KX-TC167 and the KX-TC187. The latter has multiple handset capability, and up to three extra handsets can be connected to the machine. The additional handsets are available as an option and each comes with its own charging base.

The phones have a back-lit keypad that

ensures users can see the dial pad in dimly lit areas — as well as being able to find the handset in the dark when it rings. They also have 'Ultra Charge' which charges the battery in three hours rather than the previous 10. Panasonic claims that this, coupled with the 20-day standby battery life means that the phone should never run out of power.

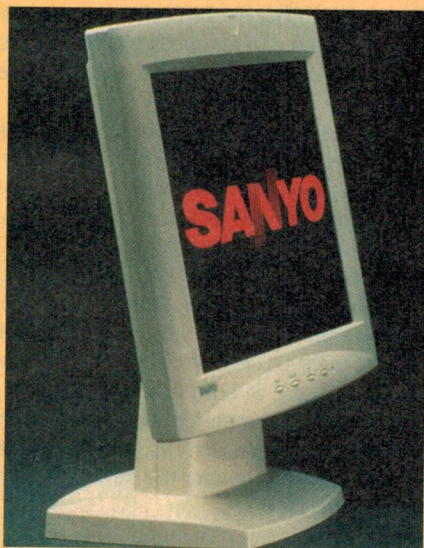
Other features include Dynamic Sound Focus Plus technology (DSF Plus), which works in a similar way to Dolby Noise Reduction in hifi systems, boosting the



voice signal and compressing background noise for clearer communication; a high-gain rubber antenna for greater range; and 10-channel auto scan, which automatically scans for the clearest channel when not in use.

The new Panasonic cordless telephones are available from leading communications and electrical retailers for RRP of \$169 (KX-TC167) and \$229 (KX-TC187). For more information contact Panasonic's Customer Care Centre on 132 600.

Flat-screen monitors from Sanyo



Sanyo's new LMU-TFT 150 flat-screen monitor has a slim 15" active matrix liquid crystal display (LCD) which is claimed to give a much clearer, brighter viewing image than the average cathode ray tube (CRT) monitor. The monitor has a resolution of 1024 x 768 pixels, but can display lower resolutions down to 630 x 350, allowing computer games to be played at high speed while still using the whole screen. Another feature is low power consumption, of only 25 - 35 watts.

The LMU-TFT 150 is fitted with two 500mW stereo speakers and has both an analog and digital interface. It provides a horizontal viewing angle of 140° and a vertical viewing angle of 120°, without visible degradation.

The unit is very low in weight and has a small footprint to conserve valuable desk space. Available from leading computer and electrical retailers, it sells for an RRP of \$2999.

New studio mic from Shure



Shure has entered the high end studio recording market, with the introduction of its KSM32 microphone. Offering exceptionally low self-noise and increased dynamic range, the side-address, cardioid condenser mic is claimed to be ideal for highly critical studio recording and live sound applications.

The mic incorporates an embossed, ultra-thin (2.5µm) high compliance Mylar diaphragm, which provides extended low frequency response while improving environmental stability. Its very low mass provides the excellent tran-

sient response to accurately reproduce any sound source. A 15dB attenuation switch is provided for handling extremely high sound pressure levels, and a switchable low frequency filter reduces vibration noise or proximity effect.

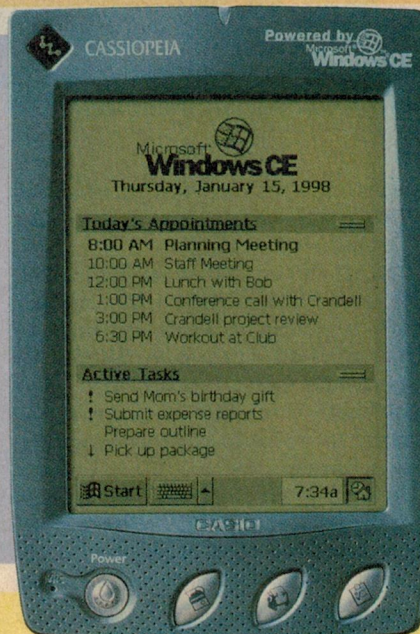
With an extended frequency response from 20Hz to 20kHz, the KSM32 is claimed to be ideal for vocals, acoustic and wind instruments, ensembles, and for overhead miking drums and percussion. However as it's capable of handling 160dB SPL and an output level of +15dBv, it's equally at home in high SPL applications such as kick drums and bass guitar cabinets.

The Shure KSM32 has an RRP of \$1595. For more information circle 143 on the reader service card or contact Jands Electronics, 40 Kent Road, Mascot 2020.

Palmtop PC with double the memory

The new 'second generation' Cassiopeia E-11 palmtop PC has double the memory of previous models and is claimed to herald a new generation in mobile information management. Compact, lightweight and easy to use, it offers seamless synchronisation with desktop PCs, infrared (IR) capabilities, a powerful 8MB of memory and expandability via its CompactFlash port.

Other features include a large, easy to read 240 x 320 pixel LCD screen with bright backlighting, with a pop-up handwriting or keyboard panel and taskbar allowing up to 30% more viewable screen. Applications can be launched by pressing



one of the four application buttons or by voice command using bundled software. Data input and other operations are performed by using a stylus or pressing the on-screen keyboard. Side positioned scrolling, enter and escape buttons make it possible to operate the E-11 with one hand.

Software applications bundled with the E-11 include Palm Golf, Casio Menu application launcher, Harmony 98 for easy synchronisation with Lotus Notes, Lotus Organiser, Symantec ACT and ECCO Information Management System, Casio's Digital Camera Viewer and the challenging Tetris game.

The Cassiopeia E-11 is available for an RRP of \$749 (incl. tax) from Casio resellers and leading retail stores.

New 8mm camcorders from Hitachi

Hitachi's new 'Platinum' VM range of 8mm video camcorders are claimed to incorporate the latest in camcorder technology. There are two new models, the top-of-range VMES45LE with Hi8 and stereo sound, built-in light source and high-resolution sensor, and the VME648LE 8mm model. Both units use dual Hitachi developed digital signal processors (DSPs) to maximise picture quality, and features including several digital effects such as Sepia and Negative, several Digital Fades, Titling and Electronic Image Stabilisation (EIS) to minimise hand held blur.

Hitachi claims the incorporation of advanced DSP microcomputers in both the camera and playback section optimises picture quality from start to finish, resulting in sharper and clearer video. The

microprocessors also automatically set key parameters such as shutter speed, iris white balance and focus.

The new camcorders also share a 240x zoom feature and a 3" LCD panel with auto backlighting, wide viewing angle and inbuilt speaker. Both models use new technology Lithium-Ion battery technology with operating times up to 12 hours possible in some circumstances. NTSC recorded tapes can also be replayed through a PAL60 signal to the TV.

The VME845LE uses a 570k CCD sensor, giving optimum results when copying tapes or playing on large screens. This model's built-in lamp can be programmed to automatically turn on when ambient light falls below a set level.

The new camcorders are available from

leading retailers around Australia, at an RRP of \$1699 for the VME648LE and \$1999 for the



VMES45LE. For more information circle 142 on the reader service card or contact Hitachi Australia, 13-15 Lyonpark Road, North Ryde 2113.

WHAT'S *new*

in the ever-changing world of electronics

Don't YOU dress up to use your IBM?

IBM sent this picture out to illustrate a press release announcing its new ThinkPad i-series mobile PCs, and its new 15" TFT flat panel LCD monitor. We couldn't resist publishing it, because of the way they've dressed the models in what appears to be their 'Sunday best'. Doesn't every family dress up like this, to use their computer? Shorts and thongs might be OK for one of those *other* brands, but not for an IBM...

The new 15" LCD monitor features 1024 x 768 pixel resolution and uses active matrix technology, by the way. It sells for around \$2299 retail. The ThinkPad i-series come in black and integrate hard disk, CD-ROM, floppy drive and modem into the one unit, eliminating cables. They also function as an audio CD player.

They're available from major retail outlets. For more information contact IBM's hotline on 132 426.



Mobile phone has inbuilt modem

Ericsson Australia has introduced the innovative SH 888, claimed as the world's first mobile phone to feature an inbuilt modem with infrared capability. It's also the first of Ericsson's mobile phones to offer dual-band functionality.

The SH 888's inbuilt modem provides immediate data access to the GSM network, from any IrDA compatible laptop or handheld computer. By lining up the infrared port on the phone with that on a laptop or handheld computer, users can access the

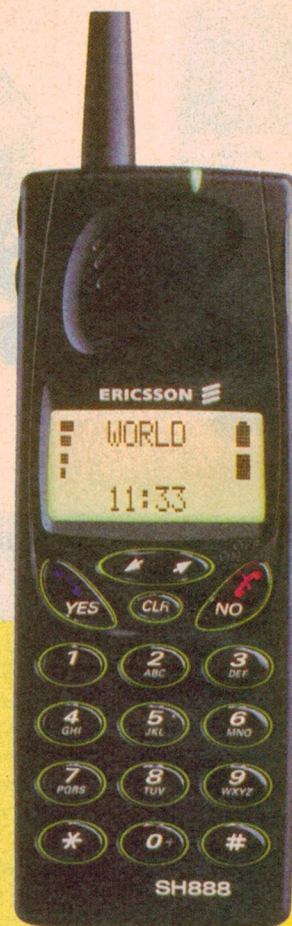
Internet, send and receive taxes, email and download files without requiring any cables or an additional PC Card.

The SH 888's dual band system accesses both GSM 900 and GSM 1800 networks. When Australian networks support both technologies later this year, the SH 888 will automatically switch between them. Users should experience enhanced quality of service due to the increased network capacity in high demand locations.

Other features of the SH 888 include Enhanced Full Rate (EFR) Speech Coding, which provides users with speech and reception quality comparable to fixed line

networks, a robust magnesium structure and hard-top keypad.

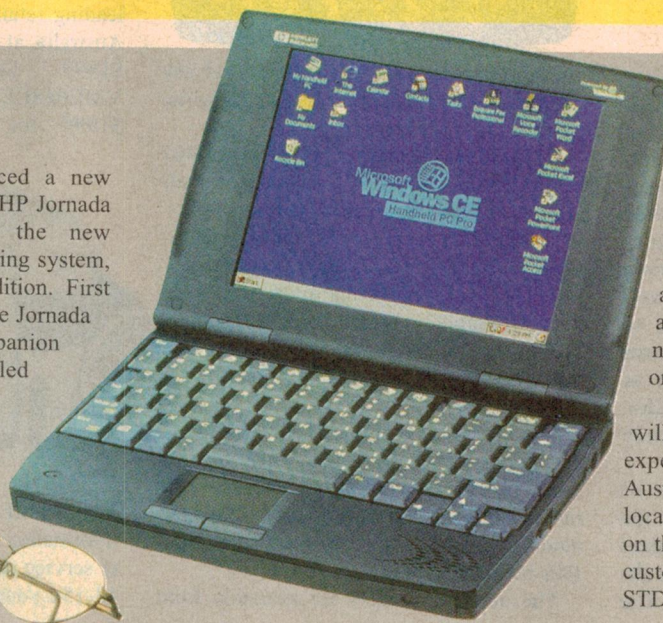
For more information call Ericsson on 1300 650 050.



HP's new 'Jornada' handheld PC

Hewlett-Packard has introduced a new brand in handheld PCs — the HP Jornada Handheld PCs, based on the new Microsoft Windows CE operating system, Handheld PC Professional Edition. First product in the new family is the Jornada 820, a 2.5-pound e-mail companion claimed to deliver unparalleled convenience and communications capabilities.

Battery life allows typing continuously for 10 hours in Pocket Word without recharging. An



instant-on Intel StrongARM 190MHz processor eliminates boot-up time, and a built-in 56kb/s V.90 modem and user-friendly HP dialup application provide quick access to e-mail and the Web.

Other features include a comfortable and quiet 'touch-typeable' keyboard and a built-in VGA port, enabling connection to any standard VGA monitor or projector.

The HP Jornada 820 Handheld PC will be available for around \$2000, and is expected to be available throughout Australia via corporate resellers and retail locations. For more information circle 144 on the reader service card or contact HP's customer service centre on 131 347 (no STD area code required).

New Swatch shows 'Internet time'

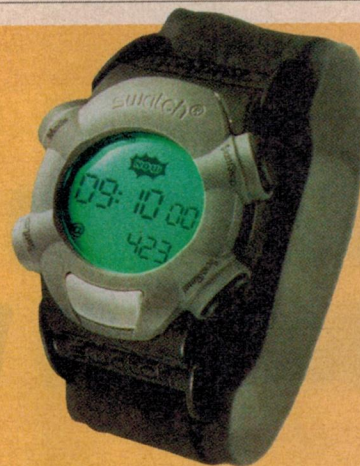
Switzerland based watchmaker Swatch has launched a new model, and with it what's claimed as 'a whole new concept in measuring time for the future': Swatch Internet Time, promoted as 'global time for a cyberworld'.

Introducing Switch Internet Time at a Junior Summit held at MIT's Media Lab, Lab founder and director Nicholas Negroponte said "Cyberspace has no seasons and no night and day. Internet time is absolute time for everybody. In the future, for many people, real time will be Internet Time."

SIT has no time zones or geographical bor-

ders; Swatch has divided the virtual and real day into 1000 'beats', with a length of one minute and 26.4 seconds. The universal reference meridian for SIT is Biel Mean Time (BMT), corresponding to the Swatch headquarters in Biel, Switzerland. A day in SIT begins at 000 Swatch Beats, corresponding to midnight BMT, with 500 Swatch Beats corresponding to 12 noon in Biel.

The new Swatch Beat watch (pictured) displays both SIT and local time, has a fixed countdown to the Y2K, plus timer, stopwatch and alarm functions.



Compact component hifi



Pioneer's new 'L-Plus' compact hifi system has won many accolades in Europe, where it's also manufactured. It includes a CD player and receiver, a subwoofer and two satellite speakers, and will sell here for \$1099.

A novel feature is the separate fluorescent display panel, which shows settings for volume, CD track, cassette, radio station, bass and treble. For more information circle 150 on the reader service card or contact Pioneer on 1800 338 439.

Cassette deck incorporates DSP

Pioneer claims its new CT-W806DR Digital Processing System (DPS) double cassette deck is the next step in development from the popular CT-W606DR, and represents 'the ultimate home tape facility', providing a crucial digitised recording link with the latest CD players and tuners. It turns analog signals from a tape into digital form for digital processing, and then back to analog. As a result it's claimed to bring the full impact of the latest 20-bit digital sound technologies to your taped music.

The deck's Digital Processing System is

claimed to intelligently isolate hiss/noise and remove it without affecting other signals. Equally impressive, the technology enables a signal-to-noise ratio of 90dB, a



range almost as wide as that of a CD. The noise can be removed from any recorded tapes, even old ones, as well as dubbed tapes. In addition, DPS makes possible

other innovative features such as Digital FLEX (frequency level expander), Digital Super Auto BLE XD (bias level and equalisation optimising) and Digital TDNS (tape duplication noise suppression).

The CT-W806DR also uses Pioneer's Legato Link technology in A/D and D/A conversion, to achieve enhanced performance. The deck is further enhanced by Dolby HX Pro (Deck II) and Dolby B/C noise reduction with built-in MPX filter.

Pioneer's new CT-W806DR double auto-reverse cassette deck is covered by a 12 month warranty and available at Pioneer dealers throughout Australia. For further information contact Pioneer on 1800 060 852.

High end subwoofer

Modestly, JBL claims its new LSR 12P powered subwoofer delivers 'the absolute best low frequency and transient response'. Incorporating a combination of new transducer technologies, the LSR 12P offers high operational flexibility and performance, making it suitable for applications from music recording to broadcast and multimedia.

A multi-input capability allows the sub-channel signal to be derived from either the LCR channels or from a completely discrete source. It's therefore compatible with both matrixed surround audio such as Dolby Pro Logic, and fully discrete 5.1-channel sur-

round systems such as DTS or Dolby Digital and the 7.1-channel environment of SDDS.

The LSR 12P uses a direct radiator approach rather than the band-pass approach used by other systems. It also uses JBL's Differential Drive (DD) technology, where two voice coils in each 12" subwoofer driver are set with their magnetic gaps at 180° out of phase. This doubles the power handling capacity of each driver, allowing them to deliver virtually distortion-free audio at higher power levels than ever before.

The JBL LSR 12P is available for \$2895 RRP and is distributed by Jands Electronics. For more info circle 140 on the reader service card. ♦



Sony's VPL-S600M Data & Video Projector

LCD-based video and data projector technology is making rapid advances, with performance steadily rising and prices gradually falling. Here reviewer Louis Challis looks at a compact new model from Sony, delivering excellent quality SVGA and S-Video resolution (800 x 600) images of high brightness — 600 ANSI lumens. It also offers a feature called Auto Pixel Alignment, which automatically detects and adjusts to different input signal formats.

TODAY'S CONSUMER and professional electronics industries are firmly convinced that they need to dazzle their intending clients with new technology that makes a dramatic visual impression.

How best to do that? Well, it's apparent that both the consumer and professional marketing personnel have decided that home cinema and computer graphics are the markets ready to burgeon. As one of the market leaders, Sony Corporation has pulled out all stops in order to develop and market a range of exciting new visual presentation systems.

This year Sony's Broadcast and Professional Systems Division will release three new portable LCD projectors, as well as its long-awaited PFM500 42" (1070mm) high-performance plasma screen display.

Plasma screens offer a visually exciting performance, but like it or not they're too heavy and far too fragile to move around the house — let alone facilitate their safe and convenient movement from one building to another. But there are innumerable situations and applications which call for a light and portable visual display system, with the flexibility to handle a wide range of computer based and more conventional video or visual applications.

Enter centre stage the latest range of LCD projectors, that are small enough, light enough and smart enough to satisfy many (although obviously not all) of these applications. We're looking at one of them here, the VPL-S600M.

Of course almost every daytime computer graphics display application which really does call for a portable LCD projector, also has a

matching (but often unspoken) nocturnal application. As you may well guess, such devices are also excellent for home cinema and group viewing of DVDs, laserdiscs and movies from a VCR — plus perhaps a smidgen of its time devoted to displaying graphics from a home PC, when one is working on an urgent project that 'must be ready by tomorrow'...

But what is this new VPL-S600M, and what does it achieve? Well, Sony has realised that the design characteristics and limitations of the previous generation of LCD displays have made them *passé*. What the market now demands is a lightweight LCD projector with compact dimensions, which should be comparable in size to the portable computer with which it is likely to be coupled for many of its more critical applications.

"Its optical system is every bit as good as the latest Wega TV sets, which currently equal or out-perform any other TV sets that we have recently reviewed..."

The development of such a device involved a combination of evolutionary and revolutionary approaches to resolve the multiple problems involved. The first step, and by no means an inconsequential one, was to discard the conventional diecast or plastic casing in preference to a magnesium-alloy casing that is extremely light, but still very strong.

The second step was to develop a brand new optical technology, employing a very

powerful 120 watt energy-efficient UHP lamp that provides high brightness and a genuine 600 ANSI lumens of output. Those elements are fairly straightforward. What Sony then did was to adopt three separate 33mm (1.3") SVGA resolution (800 x 600) LCD panels for the separate RGB components of the signal. Each of those signals is separately fed through a composite condenser lens with polarising plate, to be combined by a prism before being fed through the primary projection lens (see diagram).

One might think that splitting and then re-integrating three separate video components into a composite video signal would result in a significant loss of linearity — but nothing could be further from the truth. Indeed, using the SMPTE test patterns and a series

of other more demanding test patterns revealed that the VPL-S600M projector's optical system was every bit as good as the latest Wega TV sets, which currently equal or out-perform any other TV sets that we have recently reviewed.

(By the way, another of Sony's new models is the VPL-X600M, which offers all of the features of the VPL-S600M along with true XGA or 1024 x 768 pixel resolution.)



Automatic setup

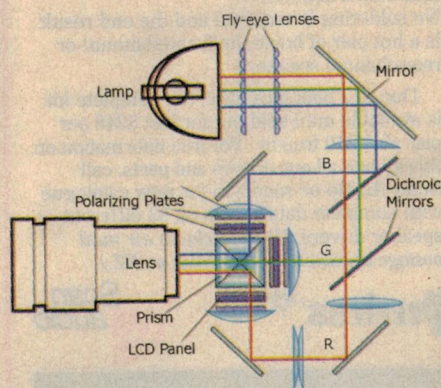
The other major attribute of the VPL-S600M projector is its ability to automatically detect and accommodate a wide range of optional input signal formats, through its Auto Pixel Alignment (APA) technology. All you have to do is to press the APA button and the projector will convert the input signal to achieve optimum resolution with its internal electronics.

Using a series of test patterns on a Reference Recording laserdisc and two DVD test discs from Dolby Laboratories and Swelltone, I was able to confirm that the automatic input recognition and scan converter circuitry achieves uniform illumination from corner to corner on the display. More critically, the display exhibited no trace of bloom with the high APL Pluge signal correctly set in accordance with the test disc's instructions or the colour chroma controls set at either the normal pre-set value, or even at the maximum possible settings.

There are two ways to set the controls on the VPL-S600M Projector. The first and easiest way is by means of the remote control, which allows you to manipulate the inbuilt on-screen display (which offers you the option of seven languages, English, French, German, Italian, Spanish, Japanese or Chinese). The on-screen display allows you to select the status, input, language, type of installation (floor or ceiling), activation of the internal loudspeakers, and even the direction from which the remote control signal

will be accessed (from the front or the rear). A series of supplementary on-screen displays provide wide range controls over most of the other variable or critical parameters.

The remote control is unusual in that it not only incorporates a laser pointer to assist a presenter with visual displays, but even more intriguingly incorporates mouse button controls with which you can exercise control of the DOS or Mac-based computer with which you are feeding the signal to the projector. The back panel of the projector incorporates sockets for connecting optional signal and mouse cables to suit the computer you use (of course it assumes that it is a modern computer).



The optical system inside the VPL-S600M. A 120-watt UHP lamp augmented by fly-eye lenses deliver 600 ANSI lumens, spread evenly from corner to corner.

Stereo speakers

The projector incorporates a small pair of stereo speakers which provide an output that is limited in level, but which is — as I found — adequate for setting up next to a bed, so that you can watch DVDs or laserdiscs from your bed. I watched two recent DVD releases (Jerry Maguire (Tristar D26093) and Matilda (Tristar D24512)) in bed, and was pleasantly surprised by the quality of the sound produced by the internal minuscule loudspeakers.

One catch with relying on that option is the level of fan noise. The measured levels at 1m from the projector are 44dB(A) to the rear, 45.5dB(A) to the side and 47dB(A) immediately above (or immediately below, if the projector is suspended from the ceiling). Sound levels of that magnitude do constitute an undesirable masking source, which has an adverse impact on the effective dynamic range of the projector's audible output. This is one feature of the VPL-S600M that I would suggest requires a little more research effort.

Of course when the projector is used in a home theatre or similar application, it would normally be used in conjunction with a surround sound system, with sound levels that would render the fan noise irrelevant.

The major design features of the VPL-S600M are its reasonably small physical size (339mm wide, 136mm high and 322mm deep), which is only one and a half times the

The Challis Report

size of a typical shoebox. Its weight is only 5.8kgs, which although not insignificant, is still only about twice that of most modern TFT LCD screened portable computers.

Last, but not least, is the flexibility of control which it offers by way of its S-Video coaxial video and conventional audio and computer signal and control input connections. Features that will also endear itself to the user include a guaranteed 2000+ hours of lamp life, and superb focussing convenience by means of an integral pattern display, which is controlled by a pushbutton on the top of the projector's cabinet.

The projector will quite happily display its images on to conventional painted walls and tablecloths (which are better ironed than being folded), but of course there is a significant enhancement in the illumination level if a conventional projection screen is used.

Summary

My overall impression of the Sony VPL-S600M LCD Projector is that this is a visually attractive, exciting and convenient means of fulfilling a wide range of multi-functional video and computer graphics display requirements, both at home and in the office, with minimum pain and maximum gain.



The connectors on the back include connectors which allow the projector's remote (which includes a laser pointer) to be used as a computer mouse.

My only real criticism of the VPL-S600M is that the cooling fan noise is 5dB(A) higher than I would desire for bedside projection using the in-built (integral) stereo loudspeakers. However I was able to rapidly resolve this problem by connecting up the amplifier and loudspeakers I already have in my bedroom.

Notwithstanding, there are many situations and occasions where it is more convenient

Sony VPL-S600M Video Projector

A compact and lightweight three-LCD video projector offering high light output (600 ANSI lumens) and SVGA image resolution.

Good points: Very bright and evenly lit image, plenty of resolution for both computer-based presentations and DVD or laserdisc based video viewing. APA auto signal alignment and built-in test pattern gives 'no hassle' setup.

Bad points: Noise from cooling fan a little high; competes with inbuilt speakers.

List Price: \$8200 plus sales tax if applicable.

Available: Sony Broadcast & Professional Systems, 33 - 39 Talavera Road, North Ryde 2113. Phone (02) 9887 6666.

to carry, or to move, only two items of equipment. Luckily in most situations one would be able to ignore the level of fan noise of the VPL-S600M.

Whilst you may consider a rear-projection TV, or even a plasma display, both of those options lack the performance and multi-functional panache of the VPL-S600M Projector to satisfy your daytime and equally demanding nocturnal visual dreams. ♦

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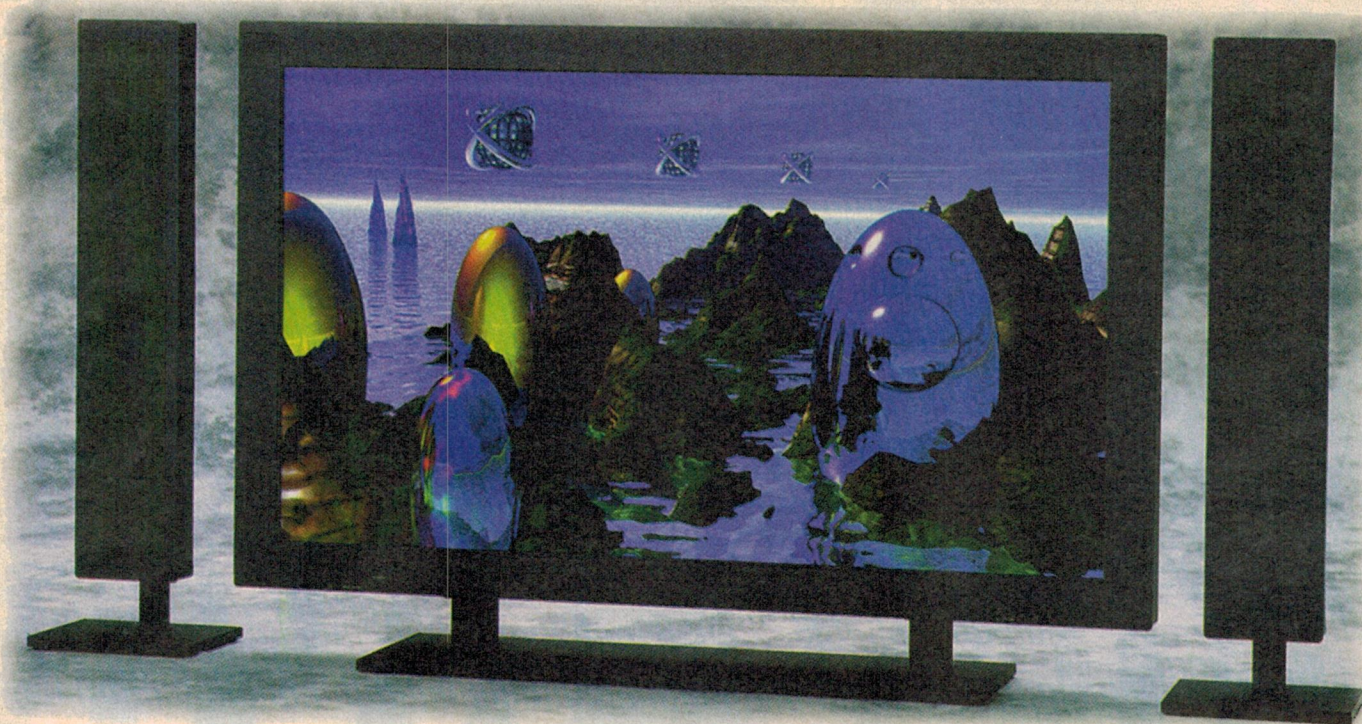
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"Terminator II" and "Men in Black" were mixed. It not only offers playback of DVD's, but is also compatible with audio CD's and video CD's. In fact, the DVP-S715's performance equals Sony's award-winning ES (extremely high standard) CD players. Bring a touch of tinsel town to your home cinema with the new Sony DVP-S715. **It's a Sony**





Home Theatre without Fears

Interested in setting up your own 'home theatre' system? More and more people are doing so, and with new technology like DVDs, large-screen TVs and surround sound systems, you can enjoy movies in your loungeroom with virtually the same impact as a big-city cinema. But how much do you *really* need to spend, to achieve a satisfying result? Here's a rundown...

by Jim Rowe

NOT VERY LONG ago, setting up a home theatre generally meant buying and using noisy film projectors, renting prints from a film library (at considerable expense), and showing them in a darkened room. The sound was mostly mono, and often quite 'low fi' and noisy — quite apart from the noise made by the projectors. It was all rather unsatisfying, as well as expensive, and few people bothered apart from dedicated home movie enthusiasts and the seriously wealthy.

All that has changed, of course. Nowadays you can set up a home theatre system in your lounge or family room, that will show movies conveniently from video cassette, laserdisc, DVD video disc or Pay TV, on a large screen

and often with full 5.1-channel surround sound. You can create virtually the full impact of a professional cinema presentation, without the hassle of coping with films and noisy projectors — or even a darkened room.

True, if you want to create the 'ultimate' modern home theatre setup it will still cost you many thousands of dollars. But once you understand how it all works, you'll discover that it's quite possible to achieve very satisfying results with a much more reasonable and affordable budget. That's the aim of this article.

So what's needed for a modern home theatre system? Well, there are probably five key ingredients, some of which you may already have:

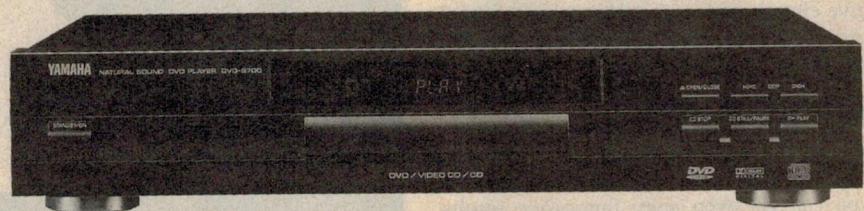
- A source of good quality video, such as a VCR, a laserdisc player, one of the new DVD (digital versatile disc) video players, or perhaps a Pay TV set-top box. Or even normal broadcast TV, in a pinch;
- A TV set or video monitor with a relatively large screen, to achieve a satisfyingly large picture display;
- A surround sound decoder, capable of extracting or synthesising the additional 'spacial' signals from the stereo or encoded surround signals recorded on your videotapes, laserdiscs or DVDs;
- A multi-channel hifi amplifier system, capable of boosting each of the various sound channels, ready to drive your

The video source

For most people, the easiest form in which to get movies for presentation in your home theatre is on rented or purchased videotapes. This means that a VHS-format VCR will be almost mandatory. Most Australian homes already have one, of course, although if it's a few years old your current VCR may not be capable of extracting from the tapes all of the video and sound information needed for satisfying home theatre.



Above is the Panasonic NV-HD670A six-head HiFi Stereo VCR, while at top is the RCA VRA868AU with similar capabilities.



Above: Yamaha's DVD-S700 DVD player, which includes a Dolby Digital 5.1-channel sound decoder.

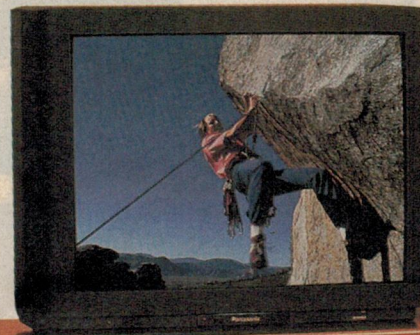
Ideally you'll need a fairly high-end VCR with good modern video heads and circuitry, and (importantly) 'Hi-Fi' stereo sound capability. An older VCR with its worn heads and mono sound will certainly give you pictures and sound, but on a large screen the picture will probably look rather blurred and snowy,

speakers; and finally

- A set of speakers, to recreate the full surround sound experience — including the gut-rumbling bass.

These then are the basic requirements, but in each case there can be quite a lot of flexibility when it comes to exactly how they're provided. Some of the items can be either separate, or combined with others. For example many modern 'audio-visual' or A-V amplifiers have an inbuilt surround sound decoder, as well as all or most of the amplifier channels you'll need; while some of the new DVD video players also have a built-in Dolby Digital surround sound decoder. Or you can simply add a separate analog matrix decoder, plus some extra amplifiers and speakers to your existing stereo system...

All of this flexibility can be confusing, of course. But if you want to set up a basic home theatre without spending any more money than is really necessary, it's wise to get a handle on the various options. So let's now look at each of the main areas in turn, starting with...



Panasonic markets a broad range of home theatre components, with a typical configuration shown here. At top opposite is a setup using NEC's impressive PlasmaSync 4200W flat plasma screen.

Home Theatre ...

and without even stereo sound signals to work on the surround sound system will be hard pressed to achieve much at all...

Apart from stereo sound capability, the other main features to look for in a modern 'home theatre compatible' VCR are those that ensure the sharpest, cleanest and most steady video image. If your budget allows, this means things like digital video processing and enhancement, digital noise reduction, digital tracking, 'S-Video' or Y/C separated luminance and chrominance video output, and digital timebase correction. The ability to play NTSC tapes may also be handy, if you want to source and view movies directly from the USA.

Although many of the newer high-end VCRs also boast four or six video heads, the extra heads as such are generally not a great advantage for replay of commercial movies for home theatre. They're mainly used to give cleaner and more stable 'single frame' images, and improve things like insert editing of your own recordings.

Laserdiscs, DVD

While you can certainly get very satisfying home theatre using a good modern VCR, you can get even *more* impressive results using a laserdisc player or a DVD video player. That's because both of these use laser-pickup optical discs instead of magnetic tape, and are capable of delivering sharper, cleaner and more steady images as well as improved multi-channel sound. The only problem is that as yet, you don't have as wide a selection of movies available on either medium, at least in Australia.

The older analog laserdiscs have been



Two of Meridian's high-end DVD players: above is the 800 Reference Player, while below is the 586 Player. Both are available with inbuilt digital sound decoders.

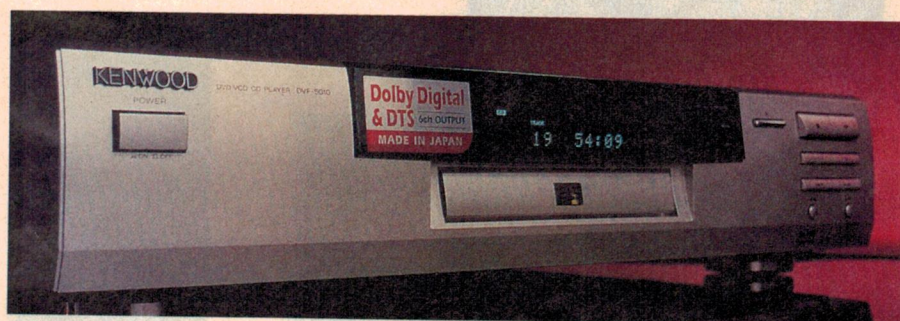
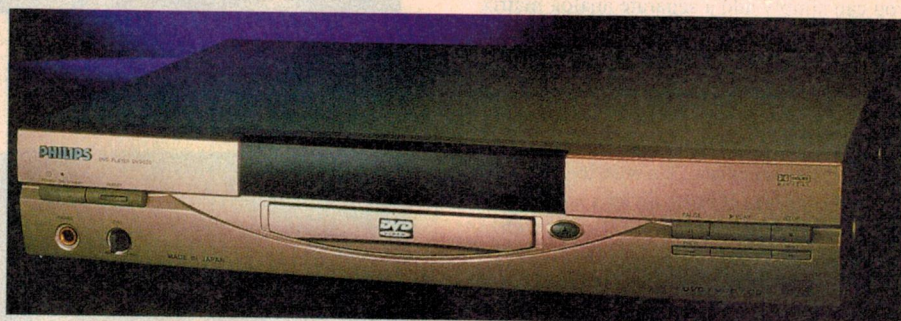


formance, they too are as yet *very* limited (read 'pathetic') here in terms of availability. Unfortunately their regional coding scheme also means that you can't even bring in discs from the USA, unless you also import your own 'Region 1' player as well...

Despite these limitations, a DVD player would also be very desirable for your home theatre system — especially if you want to experience the full impact of 5.1-channel Dolby Digital (AC-3) or other forms of digital surround sound. DVD is really the only way to achieve this at present; although some of the latest laserdiscs do provide AC-3 sound, very few players include the necessary decoder. Most DVD players at least make the digital audio bitstream available to drive an external decoder.

With some of the latest DVD players, like the Panasonic DVD-A350A and the Kenwood DVF-5010M, you also get a built-in Dolby Digital surround decoder in the player itself. This is quite a bonus, because most of the surround decoders built into existing A-V ('audio-visual') amplifiers are designed for decoding the earlier Dolby Pro Logic type of analog surround sound, and/or a variation on the simpler Hafler-type matrix decoding from stereo sound tracks.

So if you don't go for a DVD player with a



built-in Dolby Digital decoder, but you still want to be able to hear digital multi-channel surround sound in all of its glory, you'll need to get either a separate decoder or a new A-V amplifier with the decoder built in.

At the very least, to leave your options open, make sure you get a DVD player with digital and/or optical 'bit stream' audio output, as well as the usual video and analog stereo audio outputs, so you'll be able to drive a

available here for some time, but the range of movies on PAL discs has never been very wide. To get many titles you've needed to bring in NTSC discs from the USA. Laserdiscs are also large (30cm in diameter) and fairly expensive (typically around \$80 - 100 per movie).

Although the new DVD video discs are physically smaller (one CD-sized disc per movie), more reasonably priced (\$30 - 40 per movie) and capable of even better per-



Three more DVD players: at top, the Philips DVD820; centre, the Kenwood DVF-5010M; and above, the Panasonic DVD-A350.



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L I S T E N A N D Y O U ' L L S E E

Home Theatre ...

decoder in the future.

By the way, although most DVD Video discs have Dolby Digital (AC-3) digital compressed surround sound, they can also have digital surround sound encoded via other compression systems such as DTS or MPEG-2. Or they can have uncompressed 'linear pulse code modulated' (LPCM) digital audio, like that used on CDs (but with 48kHz sampling rather than 44.1kHz). So ultimately you may need other decoders as well as one for Dolby Digital.

Larger display

For a visual impact close to that of your favourite cinema, your home theatre needs to be able to present you with a picture that occupies much the same proportion of your field of view ('visual solid angle') as a cinema screen. So in a sense, the idea is to get a TV set or video projector that provides the largest possible image. The bigger the better — providing you can afford it, and your lounge room has the space!

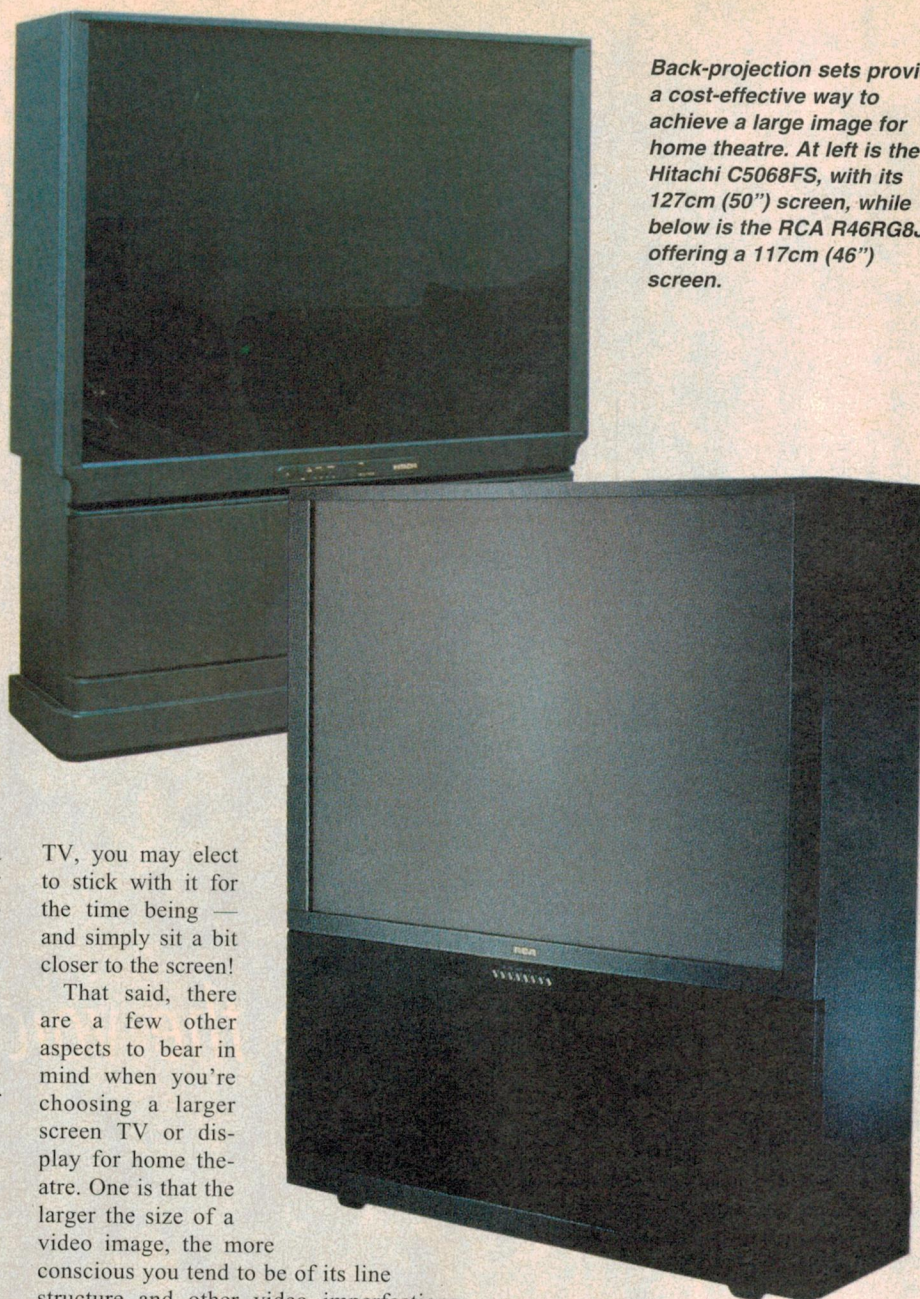
Of course it's never that simple. For a start, prices tend to go up quite dramatically with picture size. You may not be able to afford, or justify, the cost of a really big-screen image. CRT-based sets with picture sizes of 78cm (diagonal size) or more tend to cost well over \$2000, and while rear-projection TVs with picture sizes of over 100cm and up to about 132cm or so are certainly available, they generally have prices of \$5000 and more.

If you want larger picture size again, you'll generally be looking at front-type video projectors, of either the three-CRT type or the newer LCD-panel/metal halide lamp/single lens variety. In either case, prices tend to start at around \$5000 and work up rapidly, depending on the image brightness and resolution you want.

An alternative to projection sets is the large flat panel displays, typically using plasma technology. These are certainly compact, and can give you a picture size of say 105cm diagonal. But they're also very expensive, with prices typically \$20,000 or more.

"For a visual impact close to that of your favourite cinema — get a TV set or video projector that provides the largest possible image, providing you can afford it!"

So to a large extent, your decision on picture size may well be dictated by cost as much as anything else. If your budget is limited, and you already have say a 68cm stereo



Back-projection sets provide a cost-effective way to achieve a large image for home theatre. At left is the Hitachi C5068FS, with its 127cm (50") screen, while below is the RCA R46RG8JA offering a 117cm (46") screen.

TV, you may elect to stick with it for the time being — and simply sit a bit closer to the screen!

That said, there are a few other aspects to bear in mind when you're choosing a larger screen TV or display for home theatre. One is that the larger the size of a video image, the more conscious you tend to be of its line structure and other video imperfections. That's why many of the better large-screen sets and projectors incorporate special features like digital scan conversion 'line doubling', comb filtering to reduce the interference ('dot crawl' or 'Moire') between luminance and chrominance information, velocity modulation to improve video sharpness, and so on.

for a model with as many of these features as possible; they certainly improve picture impact. (The only possible complication of line doubling is with the Macrovision copy protection signals built into movies on DVD — this can play havoc with line doubling circuitry.)

A similar argument tends to apply with LCD video projectors, which generally use a system of rating their resolution in terms of either equivalent graphics adaptor format (VGA, SVGA, XGA etc) or horizontal by vertical pixels (800 x 600, or 1024 x 768 etc). In general, you need to go for at least SVGA or '800 x 600' resolution for acceptable home theatre use — and achieve the full potential of DVD, for example. XGA or '1024 x 768' resolution will be even better, if your budget allows.

The larger the picture gets — or strictly, the larger it looms in your field of view — the more valuable these high-tech enhancements become. So if your budget allows, go

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Another consideration, and a fairly thorny one, is whether you should go for a 'widescreen' TV or projector with a 16:9 aspect ratio, or one giving a conventional 4:3 aspect ratio. This is one area where there's no clear-cut answer at present.

Movies have of course been made in widescreen format for many years, and the video versions are often released in 'letter-box' format to allow you to see the full image from the original film. This means that on a conventional 4:3 TV set or video projector, you tend to waste some of the display area showing black horizontal strips above and below the picture. With a 16:9 display, the image itself can occupy the full screen for better impact.

On the other hand, a 16:9 widescreen display can't do full justice to the 4:3 aspect ratio of older movies or today's broadcast TV. Some large-screen sets and projectors let you magnify these narrower images, either linearly (where the top and bottom tend to be cropped off) or parabolically — where the sides of the image tend to be stretched outwards to fill the screen, hopefully without too much obvious distortion.

Either approach tends to involve a compromise, and which way you go probably depends on what material you expect to watch the most. If you're mainly going to be using your home theatre to watch movies, a widescreen 16:9 display is probably the way to go. Otherwise, you may prefer to stick with a conventional 4:3 type.

A final point to note is that if you possibly can, make sure you get a large-screen set or video projector with at least analogue S-Video or 'Y/C' separate

Another back-projection set, the Panasonic TX-51GF85H, which offers a 130cm (51") screen.



luminance and chrominance inputs, if not digital component (Y,B-Y,R-Y) inputs as well. These inputs will generally allow the display to produce sharper and cleaner pictures than the older composite analog video inputs, and you'll be able to take better advantage of the high image quality available from sources like DVD video players. Most DVD players provide a Y/C output, and the better players provide digital component outputs as well.

Surround decoder

An important part of the overall impact of a modern movie presentation is of course provided by its surround sound, and if your home theatre is to achieve a similar impact it needs to provide for this too.

In the form they're shown in the cinemas, modern movies generally have multi-channel digital surround sound tracks with dynamic range expansion and so on. There are a variety of systems in use, but perhaps

the three best known are Dolby Digital, DTS (Digital Theatre System) and Sony Dynamic Digital Sound (SDDS). These all involve digital audio compression, of anywhere between three and seven separate channels.

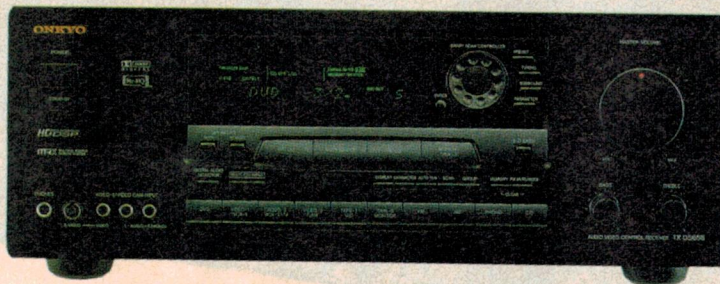
Not surprisingly movies released in the last few years for home viewing on tape, laserdisc or DVD tend to have sound tracks with variations on these same surround sound systems, or 'mix downs' derived from them. This means that generally there's at least two-channel stereo information, and often enough additional encoded surround information to drive

various types of surround decoder.

With some laserdiscs, and just about all DVDs, you also have full Dolby Digital and/or DTS surround information — capable of being decoded into a full 5.1 channels. That's five full bandwidth channels (right, left and centre front, right and left rear) plus a reduced-bandwidth 'LF effects' channel that's basically used to drive a subwoofer.

Your options, then, will depend at least partly on what medium you're using to play the movie concerned. If you're playing it from a videotape, your 'Hi-Fi Stereo' VCR

Among the high quality multi-channel AV amplifiers available are the Onkyo TX-DS656 (right) and the Pioneer VSX-D906S, both of which offer inbuilt decoders for Dolby Digital (AC-3) as well as Dolby Pro Logic.





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Reader Info No. 7

Home Theatre ...

will generally provide either plain stereo or stereo with embedded Dolby Pro Logic surround information. (By the way, even 'plain stereo' generally contains at least basic surround sound information, extractable using a simple passive-matrix Hafler type 'decoder'.)

So using a VCR your options are to use either a simple analog matrix decoder, or a 'smarter' Dolby Pro Logic decoder (as built into many A-V amplifiers and receivers), to provide what can be quite satisfying 'analog surround sound'.

These options will generally also be available if you're playing a movie from a laserdisc player or DVD player, so you can regard them as the 'fallback' options.

Of course if you *are* using a laserdisc or DVD player, then these give you an additional option — to achieve enhanced 'digital surround sound'. Here you'll need one or more decoders, though, to do the digital decoding.

A few of the latest A-V amplifiers and receivers do incorporate Dolby Digital decoders; examples are Pioneer's VSX-D906S, Kenwood's KRF-V8881D and KRF-V7771D, and Onkyo's TX-DS656. However until now, most surround amplifiers and receivers have provided only Dolby Pro Logic. If your amplifier or receiver is in this category, you'll need to use either a sep-



A home theatre setup suggested by KEF, combining their Q55 main speakers, 95C centre speaker and 30B subwoofer with a Philips large-screen TV.

arate Dolby Digital decoder box (if you can find one — they're still fairly rare), or get a laserdisc or DVD player with a Dolby Digital decoder built in.

DVD players with Dolby Digital decoders built in include the Panasonic DVD-A350A, the Yamaha DVD-S700 and the Kenwood DVF-5010M — which also includes a decoder for the DTS digital surround system.

Multi-channel amp

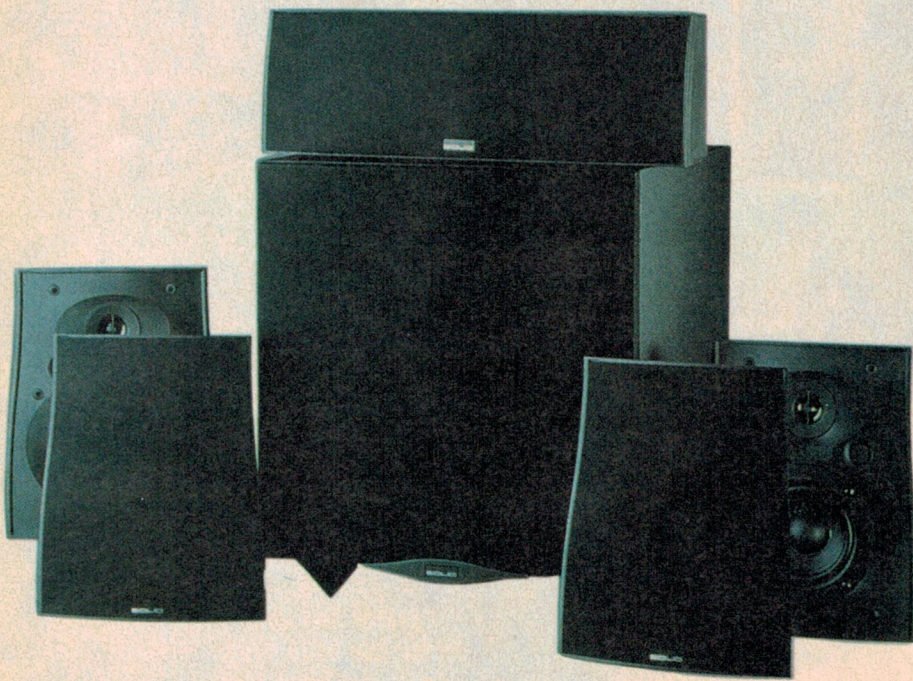
Regardless of the kind of surround sound decoding you elect to use, you'll still need a multi-channel amplifier system to boost the various audio signals up to the level needed to drive loudspeakers. How many amplifier channels you'll need will depend on the level of complexity your budget will allow, and also partly on the kind of decoding you're using.

At the simplest level, you can get away with a total of only three channels, two to handle the main front speakers and a single modest-power 'rear surround' channel for a rear speaker or two. The two front channels might well be provided by your existing stereo amplifier, so all you'd need to add is a single mono amplifier.

The next level up would be to add a fourth channel, to drive a subwoofer for more satisfying bass. This might only involve making your add-on amplifier a low cost stereo unit, instead of mono. Your main stereo amp could still handle the two front channels.

This level of complexity can give quite satisfying surround sound effects from a simple analog passive-matrix or Dolby Pro Logic surround decoding system, and at relatively low cost. However if you want to go further and achieve even more impact, you'll probably want to add a fifth and sixth channel, to handle the front centre and second rear surround channels.

If you want to go this far, it starts to get messy adding additional discrete amplifiers. The neatest way is to get one of the multi-channel A-V amplifiers or receivers that are designed for the job. Most of the larger and well-known manufacturers make a range of them, with different con-



B&W provides this Solid Solutions speaker system for home theatre, with four identical S100 monitor speakers for the front and rear side channels, the C100 centre speaker and the PB100 active subwoofer.

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By making a movie so uncannily real, you'll feel like you're in it.

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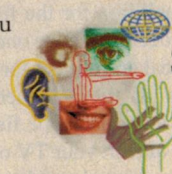
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figurations and output power ratings.

Note that very few A-V amplifiers or receivers include a power amplifier channel for the subwoofer. Mostly they provide the subwoofer output at 'line' level, ready to drive a separate subwoofer amplifier or 'active subwoofer' (i.e., subwoofer speaker with its own built-in amplifier).

For a typical home theatre setup, you'd go for an amplifier or receiver with say 50 - 80 watts output for the two main front channels, and perhaps 30-50 watts for each of the other two or three channels. By the way, we're talking here of true continuous power rating, not the inflated 'PMPO' ('peak music power output') ratings beloved by those who market mini music systems.

Surround speakers

As with the amplifier system you use for your home theatre, you have quite a bit of flexibility when it comes to the speakers. If you have a couple of good speakers in your existing stereo music system, these will probably be fine for use as the main front speakers in your home theatre setup.

In that case, you may well only need one or two smaller speaker boxes for the rear channel(s), plus perhaps a subwoofer and another small box for the front centre channel, if you decide to have one. Just make sure that the speaker you use for the front centre position is of the 'magnetically shielded' type, so its stray magnetic field doesn't upset the picture tube in your TV or video monitor. (The centre channel speaker usually ends up either sitting on top of the TV, or immediately below it.)

JBL provides three Simply Cinema setups for home theatre. This one has a subwoofer with built-in power amps and a control unit including CD player and Dolby Pro Logic decoder.



Of course your existing stereo speakers may be modest, or getting a bit old and 'tired'. You may therefore prefer to 'start from scratch' with your home theatre speakers, instead of simply adding to your hifi setup.

If this is the case, although you can certainly collect a set of speakers from different makers — or even assemble your own, of course — your simplest and perhaps safest approach is to buy a set of speakers from one manufacturer

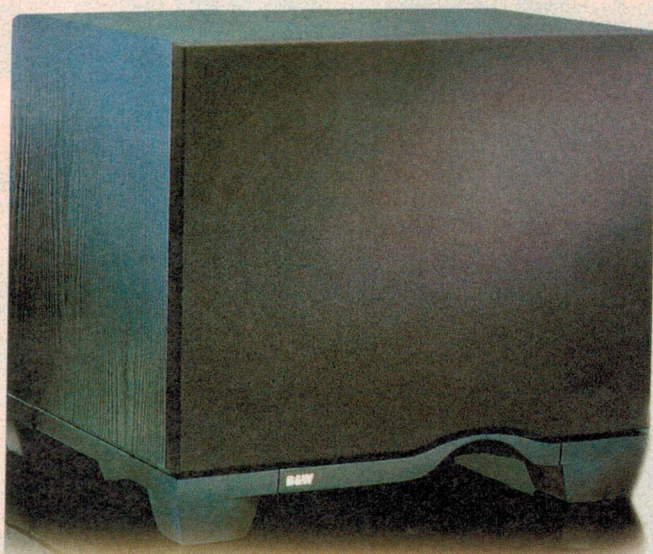
designed specifically to operate together and complement each other, in a surround sound system. Most of the well-known manufacturers produce a number of these 'matched sets', offering different performance levels, power ratings and of course cost. Some take a slightly different approach and offer a variety of 'front main' speakers, plus various 'surround channel', 'front

centre' and subwoofer models to complement them.

Some of the larger manufacturers offer 'package deals' which include a multi-channel A-V amplifier or receiver (often including say a Dolby Pro-Logic decoder), plus a complete set of speakers. Although these packages generally aren't capable of providing the 'ultimate' level of performance, they can offer very good value for money — and can provide more than enough impact for most of us.

For the absolute *creme de la creme* of home theatre impact, you do need to invest in a set of high-end surround sound speakers, plus of course a matching amplifier system driven by a Dolby Digital or DTS decoder. (Not forgetting the corresponding large screen TV or video projector, complete with line doubling.) In that case you'll probably also want to go for an amplifier and speaker system carrying the Lucasfilm 'THX' (Tomlinson Holman Experiment) certification — designed to ensure that the system is capable of delivering the full potential of systems like Dolby Digital and DTS, and recreating the 'cinema experience' in your smaller environment.

At this level, though, you'll need a very healthy bank account. For most of us, it's a matter of balancing our expectations against our budget, and accepting a few compromises along the way. If you're prepared to do this, you can end up with a home theatre setup that delivers very close to the ultimate, for a much lower outlay. Good luck! ♦



B&W's ASW2000 active subwoofer was specifically developed for high-end home theatre systems.

Home Theatre: What the Jargon Means

Here's a brief explanation of some of the main jargon terms you'll find associated with home theatre technology:

Audio Bitstream: An undecoded digital audio output, provided by many DVD players to allow external decoding back into analog surround sound audio. Needs to be used if the player does not have its own built-in decoder for Dolby Digital, DTS or MPEG-2 audio.

Comb Filter: Circuitry used in professional video monitors and high-end TV receivers to separate luminance (B&W) and chrominance (colour) information, minimising interference effects.

Dolby Digital: The most popular multi-channel digital audio compression system used for DVDs and laserdiscs, originally developed by Dolby Laboratories for cinema use. Formerly called 'AC-3', it can deliver '5.1' separate decoded audio channels.

Dolby Pro Logic: The most developed and 'intelligent' of the analog surround sound decoders, with enhanced steering logic and noise reduction. Extracts surround sound from analog 'stereo' signals.

DTS: An alternative multi-channel digital audio compression system developed by Digital Theatre Systems, used in many movies and encoded on some DVDs as well as with Dolby Digital. The cinema version of DTS uses CDs to store the audio information.

DVD: Digital versatile discs, 120mm in diameter like CDs but capable of storing over six times as much data. One DVD Video disc can contain a complete movie with up to eight sound tracks, subtitles, trailers, alternative scenes etc.

Line doubler: Circuitry in some professional video monitors and high-end TV receivers which effectively scan-converts the video signals into high-definition format to reduce the visibility of scanning lines, and also reduce frame flicker.

LPCM: Linear pulse code modulation, or uncompressed digital audio as used on audio CDs. Some DVD Video discs apparently provide LPCM stereo audio, along with Dolby Digital.

MPEG: Motion Picture Experts Group, which sets international technical standards for DVD Video, etc. DVD Video discs use MPEG-2 'Main Profile at Main Level' (MP@ML) video compression.

MPEG-2 audio: The multi-track digital audio compression system preferred by MPEG, and planned for use on DVDs in Australia, NZ and other Region 4 countries in addition to Dolby Digital. Capable of providing 7.1 channels, but as yet doesn't appear to be in use.

NTSC: The (analog) TV and video system used in the USA and Japan, named after the National Television Standards Committee.

PAL: The (analog) TV and video system used in countries like Australia and New Zealand. Essentially an enhanced version of NTSC — stands for 'phase alternate line'.

Passive Matrix decoder: A simple and low cost analog surround sound decoder, based on resistor matrixing. Can produce 4.1 surround channels from analog 'stereo'.

SDDS: Sony Dynamic Digital Sound, a multi-track digital audio compression system used in cinemas.

S-Video: Analog video in which the luminance (B&W) and chrominance (colour) information have been separated — allowing both to be of higher bandwidth without interference. Used to obtain improved picture quality from VCRs, laserdisc and DVD video players.

THX: An initiative of LucasFilm, to achieve optimum surround sound in both cinemas and home theatres. The Home THX standard specifies basic amplifier and speaker performance — plus enhancements — which allows 'cinema impact' to be achieved in the typically smaller home theatre environment. ♦

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Focus on Technology at 'slow' Fall Comdex

By all accounts, the 19th Fall Comdex show held in Las Vegas last November was the quietest for some years. The scene was set by the opening keynote address, given by Microsoft's beleaguered chairman Bill Gates, and some of the major industry players were conspicuous by their absence. All the same, some interesting new technology was unveiled if you looked around...

by Paul Swart

IT HAD BEEN quite a year for Bill Gates: he got a pie in the face in Belgium, had to testify before a US Senate Committee determined to reign in his power, was sued twice by the US Justice Department on antitrust grounds, and then had his Windows 98 demo crash on him in front of an audience of thousands of customers.

Looking tired, weary and seemingly having aged 10 years since his last Comdex keynote address a year ago, Gates tried to make light of it all at the start of his keynote address at the 19th Fall Comdex show, which lacked much of the excitement of previous years. Rather than looking too far into the future, as he has done on several previous occasions, Gates dazzled the 5000 in attendance with superb new technological innovations that are just around the corner — including some from key Microsoft business partners.

The star of Gates' performance was ClearType, a revolutionary

new software technique that dramatically improves the readability of small-font text — including italicized text — on computer screens, particularly LCD displays. Gates said ClearType came out of a development project designed to improve the readability of text in e-books such as the Sony DiscMan.

Gates conceded that while he favours the concept of e-books, the poor readability has kept him and most other consumers from embracing these products. "Even I don't use a computer to read long articles or books. We just don't have the quality that matches the printed page."

Gates explained that he'd commissioned a team headed by Microsoft engineer Bill Hill, to set out and improve the readability of small-font bitmapped text. In the past, display improvements have been mostly hardware based. Hill's team set out to determine to what

degree software could help make it easier to read electronically displayed information.

ClearType has overcome the limitations of current bitmap display technology by using a colour-based LCD display to create extremely crisp black/white text. In the process, ClearType, when incorporated into the operating system, also improves the overall resolution of LCD displays by 300%.

"I think ClearType will increase the move toward LCDs. This is just one example of a software advance that brings new capabilities to working and learning", Gates said.

ClearType will become available in e-books in 1999. Microsoft is also planning to incorporate the technology in Windows 2000, and to make an extension available for older Windows 95 and Windows 98 operating systems.

In addition to books and magazine articles, ClearType has major applications in e-mail on devices such as palmtops and other handheld computing devices, as well as for Web sites to make any text files located on corporate and other Web sites more easily readable.

Less excitement

It was Gates' second consecutive Sunday evening keynote address. By Monday afternoon, however it was evident that Comdex 98 would not go into the record books as one of the most exciting industry events. Attendance was down considerably, as evident by the availability of hotels rooms and a substantial number of vacant booth spaces. Show floor aisles, while still crowded by any normal trade show standards, were also not as densely packed as in years past.

The number of major new products was also far smaller than in past years, as evident in a press room that featured only a little over half the number of media kits available in previous years. The number of after-show bashes was way down, and contrary to the spare-no-expense bashes of past years, most events were more low key and almost all by invitation only.

Observers noted that Comdex attendance was experiencing the impact of the global recession that kept many foreign visitors home and forced some companies to cancel participation in the event. The show was undoubtedly also impacted by decisions by some of the PC industry's biggest players — most noticeably IBM, Compaq and Apple Computer — to forego Comdex in favour of exhibiting at other, more 'vertically oriented' events.

Other keynotes

Perhaps because of the uncertainties of the world economy, other Comdex keynote speakers also focused mostly on current issues and products rather than glitzy visions of computing in the years ahead.

Unlike his visionary speech of last year, Compaq CEO Eckhard Pfeiffer emulated Bill Gates and focussed most of his keynote address on new or soon-to-be-introduced products. Pfeiffer showed off Compaq's new line of Presario systems with built-in 1.5Mb/s high-speed Internet access, and the just launched direct sales program that lets consumers and small businesses buy directly from Compaq for the first time.

The new line of broadband-ready Presario PCs come with 1.5Mb/s DSL (Digital Subscriber Line) modems. The Presario 5100c series starts at US\$1599 with the new 400MHz AMD-K6-2 processor, 128MB of memory, a 8GB hard drive, a DVD-ROM drive, and a 17" monitor. Compaq will also offer consumers a new Triple Play broadband Internet access program, which offers customers a choice of three high-speed Net access options: cable modem, DSL or satellite.

Pfeiffer said initial response to the firm's new direct sales program has been very strong, with overall direct sales jumping 120%. He said

Compaq had to get into the direct-sales business or forfeit one of the fastest-growing parts of the PC industry, where Dell's sales have outpaced Compaq's for much of the past year. "It is exceeding our expectations."

Pfeiffer said he expects to take Dell head on in the direct-sales market, while preserving his focus on distributors. "This is what Dell has been fearing: that one of the big guys would pull out the gun and go direct."

Pfeiffer also reiterated Compaq's commitment to the 64-bit Alpha processor technology acquired when Compaq merged with Digital. He showed several clips of high-end animated graphics to demonstrate the chip's power, and also announced plans to make Digital Unix highly interoperable with Windows NT.

Barratt debacle

There's never been a Comdex keynote session like the one given by Intel CEO Craig Barrett, and hopefully there never will be again. Luckily for Barrett, only 3000 of the planet's population was on hand to witness the complete and utter debacle in which the soft-spoken, introverted head of the world's largest semiconductor maker found himself arguing over the relevance of the Lewinsky sex scandal with a panel of hypermedia extroverts, most of whom had no idea what they were talking about.

Attendees who had turned up expecting to learn about Intel's visions for the future of personal computers, networking, micro-processors and the company's response to challenges such as from AMD, instead found themselves sitting through a really painful public relations disaster.

During past Comdex shows, former Intel CEO Andy Grove dazzled audiences with detailed visions of his company's future, backed with awesome technology and product demonstrations. But this year Intel decided on a industry 'issue discussion panel' featuring a take-



Microsoft chairman Bill Gates III focussed his keynote address on products, like the company's new ClearType technology. Our lead shot shows Toshiba's impressive megabooth, taken over from IBM.

off on the popular late-night television talk show *Politically Incorrect* and even hired the host of the program, Bill Maher, to preside of the 'Technologically Incorrect' show. Also on the panel were industry analyst Esther Dyson, comedian Penn Jillette and Public Broadcast network TV scientist Bill Nye.

After a few good jokes by Maher ("You people are Las Vegas' worst nightmare — you're not interested in girls and you understand math") the panel quickly digressed into a meaningless discussion over the importance of personal computers, the need for the government to supply computers to the poor and govern access to porno sites. Barrett found himself arguing over Internet pornography, Internet sex, and comparing Microsoft's legal troubles with Bill Clinton's Lewinsky affair. Comedian Penn Jillette frequently tried to stir the crowd by barking out obscenities.

Ironically, just before his keynote address Barrett did have some interesting things to say, particularly about Intel's networking strategy. He said Intel is planning to buy more computer-networking companies to boost its share of the fast-growing small business and home networking market. Additional takeover targets are likely to be makers of low-cost networking gear that Intel will sell in volume through distributors.

Intel typically invests in companies that have technology to spur demand for PCs. The fact that networking-equipment makers like 3Com Corp and networking chipmakers are putting more networking functions into their chips is a plus for Intel. Some analysts continue to speculate that Intel may be interested in acquiring 3Com, but the latter has maintained that the firm is not for sale.

Fierce rivalry

Microsoft and Oracle used Comdex to step up their fierce rivalry, as Microsoft announced it would integrate much of its new SQL Server 7 database software into its forthcoming Office 2000 business suite. Oracle fired back by announcing the development of 'Raw Iron', a new version of its Oracle8 database software that doesn't require an operating system from Microsoft.

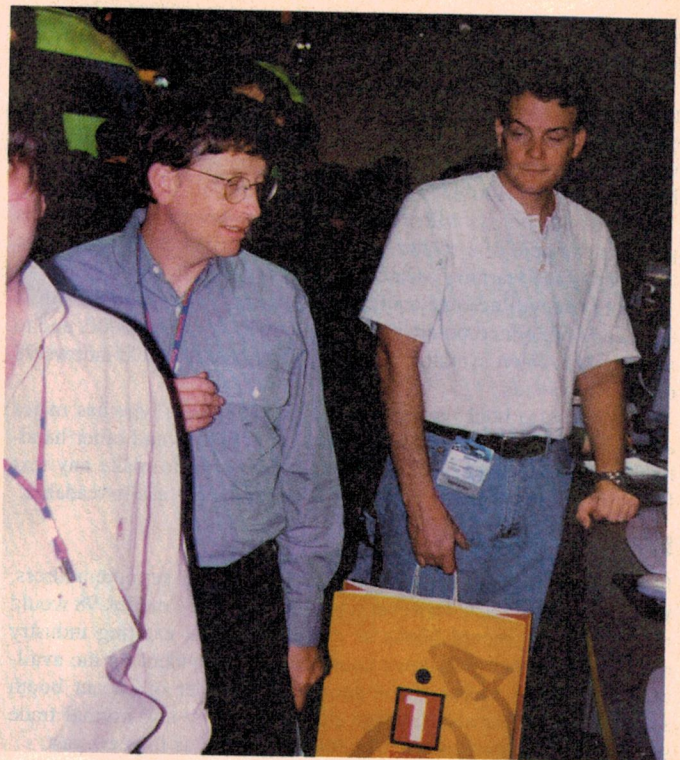
Industry analysts and legal scholars immediately raised new antitrust concerns over Microsoft's plans to closely integrate SQL Server 7 with Office 2000. While Microsoft ranks a distant third in the market for large-scale database software, leveraging its dominant position in the office suite market could be viewed as potentially illegal. "The integration and tying issues are quite similar", said Jonathan Jacobson, an antitrust attorney in New York.

Microsoft president Steve Ballmer said the integration of SQL with Office 2000 will benefit customers. It would allow a user of the Excel spreadsheet program to more easily view and manage files stored on an SQL database. "I think what we do is very well-motivated by creating the best value to customers. I don't think anything we've done should have raised any antitrust concern at anytime", Ballmer said. Meanwhile Oracle's Raw Iron project represents Oracle chairman Larry Ellison's latest attempt to try to do away with the need for Microsoft's main product, or at least diminish its importance. Three years ago, he launched a failed attempt to promote network computers (NCs). Steep drops in the price of general-purpose PCs eliminated the price advantage of NCs.

Cellular meltdown

Each year a growing percentage of Comdex attendees come equipped with cellular telephones, and rely on the devices to schedule appointments and keep in touch with the home office. Imagine thus the confusion and frustration when the crowd was plunged back into the communications stone age, because the excess demand overwhelmed the Las Vegas cellular phone network.

Most callers started to get rapid-pulses and endless busy signals,



Swinging around to take a photo at the Sony booth, Paul Swart accidentally elbowed a relaxed Bill Gates, quietly checking out the products on display. The guy on the right recognised him, too!

while others became unwilling parties to other phone conversations. "When there are this many people who are progressively wireless in one time and place, there's bound to be problems", said Bill Sell, general manager of Comdex. The problem caused Comdex attendees to stand in long lines at the relatively few pay telephones around the convention centre.

Anticipating the large demand, AT&T and other communications providers had brought in portable cellular towers, known as Cells on Wheels or 'COWs'. AT&T had herded all the COWs it had on the West Coast over for the show, but that *still* proved insufficient.

111 peripherals!

In contrast to the Las Vegas cellular phone network, a single PC on display at Comdex showed it was able to function normally despite having a 'world record' of 111 peripheral devices hooked up to it — including mice, joysticks, external drives, DVDs, keyboards, digital speakers and video conferencing systems.

The demonstration, by Intel and the USB Implementers Forum (USB IF — an industry group representing more than 500 companies worldwide) was designed to highlight the need to lower the skill level required to connect computers into networks.

USB specifies peripheral connections for the PC, and provides a uniform approach for developing products so they interoperate seamlessly through a one-size-fits-all plug and port connection.

"This is a major milestone for our industry and for the consumer. In four years, USB has gone from an idea to a mainstream market technology that makes computers easier to use. USB will appeal to existing and new PC users who are looking for simpler ways to attach a variety of different peripherals to the PC", said Steve Whalley, USB IF chairman and connectivity initiatives manager at Intel.

"USB is a late starter that is now running well", said Dataquest analyst Martin Reynolds, declaring "1999 should be the year of USB. And if it isn't, I'll return next year and proclaim the same of 2000."

The market for USB-based devices could hit nearly 400 million



Here's what Paul wanted to capture: Sony's new sub-notebook, with video camera built into the display surround. If you look closely, it's showing Paul and his camera...

units by 2002, according to Cahners' In-Stat Group. Another big boost is expected when USB compatibility is offered in future versions of Windows CE, UNIX, and Linux.

Internet dominates

Not surprisingly, an explosion of Internet-based hardware appliances and software products was on display at Comdex, ranging from products to manage corporate networks to consumer titles for Internet publishing a range of multimedia content.

Stealing the show was Cyrix, the microprocessor subsidiary of National Semiconductor, which used Comdex to demonstrate a prototype of its WebPad, a wireless device the size of an Etch-a-Sketch toy that consumers can carry anywhere around the house and let them browse the Web, send e-mail and perform a variety of other computer tasks.

Cyrix said it is partnering with Internet service providers, telephone companies, cable providers, and PC makers to build the devices and provide services. Cyrix says the first products could ship to consumers starting in mid-1999.

The WebPad prototype is a thin, flat pad with a 10.4" active-matrix display; it runs on the Cyrix Media GX processor. You can hold the WebPad on your lap like a notepad. It runs four to six hours on a lithium-ion battery and weighs less than three pounds.

There's no modem in the WebPad. Instead, it uses radio frequency transmissions (500-foot radius) to tap into the Internet via either a dial-up, cable modem, DSL or DirectPC-type satellite access connection. The WebPad also has built-in speakers and a microphone for making Internet phone calls.

Cyrix says the devices will cost about US\$300 to build, and said many ISPs may give the WebPads free to subscribers and just charge them a premium fee per machine.

Other Internet product highlights included:

- LaserFiche introduced a new version of its 'scan to the Web' publishing system, designed to allow customers to post huge volumes of documents directly to the Internet. LaserFiche WebLink include access to multiple databases, the ability to view image annotations, and advanced security options. It carries a list price of US\$7995 to \$16,995.
- Yesler Software formally launched Yesler Alive, an application designed to allow users to incorporate audio, video and other media into a presentation or report, and then post it to the Web. Yesler Alive will be available for a free 90-day trial from the company's Web site and will be priced at US\$195.
- Play introduced Trinity GlobeCaster, a 'do-it-yourself Internet television station'. The product takes digital video and scales it in real time to the desired network bandwidth using a hardware-based pixel filtering technology, and then broadcasts it using stan-

dard video server software such as Microsoft's NetShow or RealNetworks' RealVideo. GlobeCaster works with any IP-based network and is priced at US\$6995.

- Sharp unveiled TelMail, a portable e-mail appliance for sending and receiving e-mail messages using a regular telephone. TelMail uses the PocketMail service from PocketScience, which charges a monthly fee. PocketMail also allows users to send faxes.

Home networking

As personal computers find their way not only into more homes, but into more rooms in those homes, the need for sharing peripherals such as printers and storage devices is rapidly developing into a major new market. Several dozen companies displayed new products to connect computers in the home, most over traditional telephone and electrical wiring, some over shortwave radio.

Only 3% of all home PCs today are linked into networks, but that is expected to increase quickly, according to market research from Media Metrix. "Home networking products are crawling out of the woodwork. Companies I haven't even heard of are talking about networking products", said Tim Bajarin, a high-tech consultant with Creative Strategies Research International in San Jose.

- Epigram of Sunnyvale is a start-up that uses telephone wiring to let users swap data, video and audio between machines and share Internet access.
- Philips Consumer Electronics on the other hand introduced new wireless technology to provide links between a person's PC and the TV. Ambi, as it is called, transmits computer information and graphics via radio waves to a receiver perched on the TV set, which in turn relays the signals to the TV monitor. Using a remote keyboard equipped with an infrared sensor, people can view and manipulate information on the TV screen much as they would with a computer.

Ambi's biggest drawback, however, is that text and icons appear fuzzy on the TV screen, limiting its use mostly to sharing games and other graphics-heavy software. At US\$500-\$700 for two transmitters and receivers, Ambi is also too costly for most consumers. A less expensive version to link only PCs will cost just \$300 for two computers, according to ShareWave, which developed the wireless technology for Philips. ShareWave is talking to other companies about selling products before next summer.

- Meanwhile, Intelogis showed a US\$180 product that uses a home's existing electrical wiring to transmit information between computers — such as sharing files and printers, or playing computer games.

Brush with fame

"Ooops — sorry", I said, after I turned my body and accidentally elbowed another visitor in the crowded Sony booth where I was trying to take a picture of the Sony sub-notebook with built-in camera. It wasn't a hard bump, and I'm sure it didn't hurt — Bill Gates!

What's the odds on that, eh? But there he was, dressed ultra casually for a man with \$50+ billion, admiring a Sony digital photo studio product on display in the booth. As surprising as the accidental bump was the absence of the army of admirers and bodyguards that one would expect to surround Gates. He seemed to be able to move around pretty much unnoticed.

Not unexpected at Comdex is what you can get people to do in the name of a free T-shirt, squeeze ball or some other geekaw. Take Agfa, for example, which was pushing hard for its new digital scanner products. As a 'reward' for sitting through a 15-minute presentation, visitors would get a box with a large hole on one side, that you can stick your head in and wear as a hat.

No amount of money would get *me* to do that, but thousands of Comdex visitors were apparently happy to walk around all day with the things on.

Another company, Altiris, had a non-stop long line of people waiting for a chance to show off their 'machismo' and climb a vertical 30-foot wall, for the reward of a T-shirt.

Smaller, but bigger

Smaller is bigger? Only if you believe the Ziff-Davis people who insisted that this year's Comdex show was bigger than ever. Never mind the fact that several large halls in previous years filled with hundreds of exhibitors were now used as company meeting rooms and for keynote addresses.

On the other hand, some of the existing large exhibitors, especially Japanese and Korean firms, vastly expanded their booth space. Toshiba not only took over IBM's largest Comdex booth space, it gobbled up several adjacent spaces to create a booth that spanned the entire width of the main convention floor. Mitsubishi's booth was also large, but had so few products on display, there were nicely carpeted empty spaces big enough to fit several tennis courts. What were they thinking?

This year's Comdex, however, clearly missed some of the excitement of years past as there wasn't any major new product or technology launched at the show. Instead the emphasis was mostly on improvements and extensions of existing products and technologies. Laptop computers are getting smaller, desktop monitors thinner, network security tighter and a slew of other gadgets like digital cameras are just getting better.

Flat panels, laptops

One clearly evident trend in the PC market is the move towards flat panel displays which were evident everywhere, in all shapes and in all price ranges — up to US\$30,000 in some super large, super high-resolution cases. Prices of the average 12-15" flat panel displays are falling rapidly, to around US\$600-800 in most cases. Analysts predict that as volume on these displays is moving into ever higher gear, prices will come down even more in the next two years.

Some FPDs are also sporting touch screen capabilities. There was considerable talk around the show floor that 1999 will be the year of the flat panel, as business start putting them into offices and consumers start buying them for their home to replace bulky CRTs.

Comdex 98 will also go down as the year in which palmtop and other sub-notebook computers finally moved away from the hard-to-read green screens to full-colour LCD, yet still enabled the user to get 10-20 hours of use out of a single set of batteries. Several companies, including HP and Vadem showed off full-colour LCD-based handheld and sub-notebook systems.

Perhaps the biggest star of Comdex was a US\$2300 sub-notebook from Sony that also includes a digital camera built into the top centre of the display. The gadget allows professionals in the field, such as insurance claim adjusters, to take photos with their computer and instantly incorporate the images into their reports.

On-line competition

In perhaps an ominous sign for Comdex and other trade shows, the online equivalent of Comdex was launched at the start of the show and the results were stunning. It took Comdex 19 years to reach the point where 220,000 people came to visit this most recent Las Vegas show. It took ShowExpo just 12 hours to register 250,000 visitors on opening day of the first online high-tech trade show.

ShowExpo is a leading developer of online tradeshows. It inaugurated the Fall Technology ShowExpo online tradeshow to coincide with the start of Fall Comdex. More than 200 high-tech companies



111 peripherals: Brad Hosler, senior engineer at Intel's Architecture Development Lab, plugs computer mice into a USB hub, as part of the demo of 111 devices hooked up to a single PC, at the USB IF booth. (BusinessWire photo)

have signed up for the Fall Technology ShowExpo, including industry leaders such as Hewlett-Packard, Corel, Micron and Xircom.

"The era of the online tradeshow has officially dawned", said Harry Tsao, VP of marketing at ShowExpo. "Many large and small companies are leveraging ShowExpo to augment their current tradeshow strategy, while others are abandoning traditional tradeshow venues altogether and taking a more cost-effective online solution with ShowExpo."

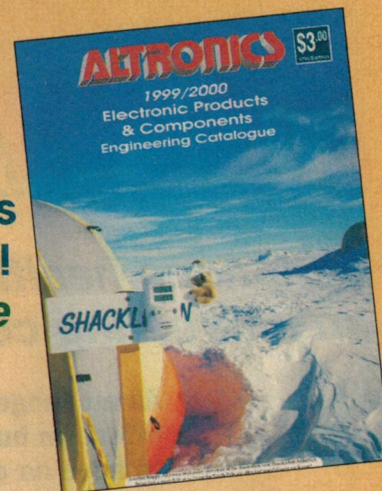
The virtual expo offers visitors an entertaining and high-content information resource, complete with live one-on-one communications solutions, marketing collateral and much more. One feature, NETcall, allows an attendee to be connected directly to an exhibitor representative. Exhibitors can offer the visitor video presentations, send them brochures as e-mail attachments. Attendees are also provided with a virtual briefcase, where they can store product and other information they gather at the various virtual booths. (ShowExpo is available on the World Wide Web at <http://www.ShowExpo.com>)

Still, if Comdex is good enough for Bill Gates to be seen wandering around, two full days after his keynote address, searching for people to meet and products to discover and review, I think the medium is probably good enough for the rest of us for a long, long time. ♦

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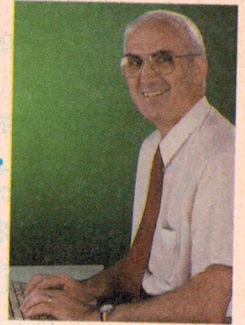
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Cellphone health risks: an interesting courtcase ends in the UK

As a change from talking about electronic devices that are supposed to have an effect on human health, I thought we'd look this month at devices that are claimed to have no effect whatever on human health — cellphones. Or at least that's what the authorities are still keen to assure us. This was the main bone of contention in an interesting court case that recently came to an end in the UK.

I DIDN'T GET much media coverage over on *this* side of the world, but back in May last year British EMF researcher and author/activist Roger Coghill began legal proceedings against a retailer of cellphones. Mr Coghill was apparently concerned that the UK health authorities were 'dragging the chain' on tightening up the standards on EMF radiation into the users' heads from these devices, in the light of growing evidence about the risks thereto, and decided to try forcing their hand with a legal test case. He chose to challenge a retailer, on the basis that by selling the devices without a health warning label, they were contravening the UK's Consumer Protection Act.

The case finally came to an end late last year, with the court finding that no illegal act had been proven against the retailer concerned, but studiously avoiding the conclusion that cellphones don't pose a health risk. Again this wasn't given much media coverage here, despite the fact that the case had raised quite a few interesting points — and had also revealed quite a bit about the cellphone industry and the health authorities in various countries.

This being so, I thought we'd take a closer look at the case and think about its ramifications for ourselves, to ensure that *EA's* readers are a little better informed than the average cellphone user.

To begin, then, let's set the scene with the original announcement of the courtcase, by Roger Coghill himself:

At the Cwmbran Magistrates Court, South Wales, today (5 May 1998) a summons was issued under section 10 of the UK Consumer Protection Act, 1987 for Roger Coghill to bring a private criminal action against The Telephone Shop UK Ltd, a retail distributor of Orange and Motorola mobile phones.

Coghill's action claims that the distributors failed to affix labels to their handsets warning of possible health risks to users from prolonged conversations. Coghill presented scientific evidence to the Court that

there could be a health risk from using mobile phones excessively. "The mobile phone is the most radiative consumer appliance yet invented", he told the media, "yet in use we normally hold it close to the brain, arguably the most sensitive organ of our body, for undetermined periods. These radiations have been shown in lab studies to cause doubled lymphoma in mice, breaks in DNA, loosening of the blood-brain barrier, cataracts, loss of memory, and lowered levels of a brain hormone, melatonin, vital for protection against cancer.

"Large scale research programmes in several countries are already trying to find the extent of the health risk, but these will take up to five years to get the answers. Meanwhile it makes sense to adopt a policy of prudent avoidance, and warning labels will help the public awareness of the possible hazards. Anyone using a mobile phone for more than 20 minutes at a time needs their head examined.

'Advisory' Board...

In the UK the National Radiation Protection Board (NRPB) advises Government and industry on radiation risks, but no longer has any scientists except one looking at the non-ionizing part of the spectrum, basing its recommendations on other scientists' research and an Advisory Group. Last week the International Committee on Non Ionizing Radiation protection (ICNIRP) announced guidelines similar to those of the European body CENELEC, some five times more strict than those of the UK.

In a recent authoritative work on Mobile Communications Safety (Chapman & Hall, 1997, pp26-27) contributors pointed out that the radiations of some mobile phones actually exceed guidelines based only on thermal considerations, whilst increasing scientific evidence points to adverse bio-effects at levels far below these.

Coghill confessed astonishment that the NRPB guidelines were now the most lax in

the whole world, and that the British Government, which has powers to insist on warning labels being affixed, has not acted quickly in the public interest. From none a few years ago there are now eight million mobile phone users in the UK, he pointed out, and probably up to 10% of them habitually use their handset for over 20 minutes at a time.

"These 800,000 people are probably the ones at most risk: we looked at the way mobile phone coverage has spread across Britain, and were shocked to find that it was followed by regional sharp increases in lymphoma", he claimed. "In East Anglia, where coverage came early, there is an above average lymphoma incidence since the mid 1980s, whereas in Wales and Scotland, which are still mountainous and valley areas where coverage is difficult, lymphomas are still comparatively low. It makes sense against this background to limit calls to a few minutes, but the networks are encouraging contracts offering unlimited phone use at certain times".

Coghill called for the puny non-ionizing research efforts of NRPB to be replaced immediately by a new research body with a £5 million annual budget, funded by a levy on the massively profitable power and communications utilities, and truly independent of any vested interest. "The mobile phone industry was supposed to have a \$25 million health effects research budget, but has not been doing proper research, and spent most of this money on on PR and flashy offices, and is still getting away with murder, he argued, contrasting it with the drugs industry where millions are spent ensuring the safety of pharmaceuticals before they reach the public".

"The NRPB apparently now only have one in-house biologist looking at the entire non-ionizing spectrum, whereas powerlines, TV and radio, radar, domestic electric appliances, computers and all the new technology of the late twentieth century could be affect-

I DON'T LIKE
THE LOOKS OF
THIS...



NRPB



ing 100 percent of industrialized communities. This is clearly inadequate".

So that's how it started. The case began in court in late June and then in November, receiving a fair bit of media coverage (at least at the start) in both the UK and the USA. As the case progressed, it gradually became clear that some pretty big guns were acting on the side of the nominal retailer defendant — including the NRPB itself.

'Not proven'

In the end, of course, the court found that the case against the retailer was 'not proven'. However some interesting things had happened along the way. Here are some comments from John Simpson, from MicroShield, the company which you may recall makes a shield to reduce the radiation from cellphones into the user's head:

As usual, the NRPB continued to demonstrate their impartiality by acting as the main defence witness for the mobile phone dealer, in the court case brought by biologist Roger Coghill.

Ultimately Coghill's lawyers were unable to prove beyond any doubt that the defendant had transgressed the provisions of the Consumer Protection Act 1987, but the magistrate took time out to stress that this case was nothing to do with whether placing warning labels on mobiles was justified. Even one of the NRPB entourage was quoted

on national TV as saying that mobiles may well be implicated with health effects, which is the least he could say bearing in mind that seven days previously the NRPB had issued a press release announcing it had launched its own research program into links between mobile use and brain cancer.

Due to a quirk of English law, this information was inadmissible as part of Roger's case as it had occurred after the summons was issued, as indeed had much of the recent published research, including possible dangers to pregnant women and their unborn babies, and two studies actually sponsored by the cellular industry showing increased blood pressure in human volunteers caused by constricting arteries (published in the *Lancet*), and yet more studies showing DNA damage in human cells. Also excluded was one of the recent UK Department of Health studies which confirmed what had already been shown in American research, which is that mobile phone type radiation is implicated with short-term memory loss...

...another fact to emerge from the case was the disproportionate amount of research funds which the NRPB allocated to non-ionising radiation studies, which either actively or passively affected 100% of the population, as opposed to ionising radiation which affected directly only those relatively few thousands who worked in the nuclear industry.

Another remarkable disclosure revealed was that the NRPB's Dr McKinlay, who is chairing the EU's five-year research program, was himself not qualified in any biological or medical discipline and had, up to that point, only been personally involved in one mobile phone related study, which was non-biological in nature.

Interesting, don't you think? In particular, the way the case seems to have spurred the authorities into action, even though it nominally 'failed' to achieve its original purpose. Here's how the case was summarised by Roger Coghill's colleague Alasdair Philips, who is an EMC engineer and fellow EMF-bioeffects researcher:

Although we lost the action (I thought we would) we also won a great and enlightening victory. The case against the mobile phone supplier under the Consumer Protection Act was found 'not proven' as the man had listened to Roger's evidence and then asked the NRPB, Trading Standards and the Federation of Communication Suppliers, all of whom said that there was no firm evidence against phones and therefore no need to attach warning labels. Also he claimed he did not know of any customers who had been made ill by using a mobile phone in over 10 years of trading.

Their costs were awarded to be paid out of central funds and the Chairman of the Bench (=judge) stated that they had NOT ruled

about the need, or not, for warning labels, but just on the case against Mr Morgan under the 1987 Consumer Protection Act.

The great and enlightening victory was in getting the UK NRPB into the dock and showing them up as apparently incompetent and untrustworthy.

My evidence quoted from their own documents showing that they actually admitted that there are many EMF bioeffects 'which may have health implications' but that they were not prepared to communicate these concerns to the public until they had 'firm and conclusive proof' that the effects were real. This is unacceptable under the Precautionary Principle which the UK has accepted to apply in environmental issues — initial warning action should occur long before final proof of cause is known.

Our barrister (Hugo Charlton) cross examined Alastair McKinlay, the Head of the NRPB Non-Ionising Department for almost three hours and made him look very small. From issuing his evidence, which was very pompous, he was shown to have not published anything in the peer-reviewed literature on electromagnetic fields and health other than a couple on light and editing the EU Expert Group Report which asked for 26M ECU (over US\$30M) for more research. This is the first time that anyone has succeeded in getting the NRPB into Court under Oath.

Epidemiology (the study of the health of people in the community) is apparently not enough on its own for the NRPB to publicly admit that there might be adverse health problems from EMFs. We produced 53 peer-reviewed scientific papers showing human, animal and cellular EMF bioeffects and Dr Alastair McKinlay refused to even comment on them as he 'did not understand any biology or human health medical issues and was therefore unable to comment'.

Even when the Chairman of the Bench pushed him for a personal comment, he still refused. This is the man who is Head

of the NRPB's Non-Ionising Department, who frame the regulations regarding acceptable EMF human exposure levels! He is also the Chairman of the European Expert Group on possible Mobile-Phone Adverse Health Effects!

Most of the UK publicity was positive for our cause, as they reported the first day in detail (our evidence) while, because we 'lost' only a few bothered to print anything much about the second and final day with the Judgement.

Richard Branson ('Virgin' group of companies) has just announced he has advised all his staff only to use mobiles with hands-free kits or shielded. This made front page Sunday Business headlines this week.

So we may have lost a skirmish, but have strategically moved forward I believe.

Hmmm — it must have been interesting in that courtroom, mustn't it? It also seems a bit strange that the head of the NRPB's Non-Ionising Department has no background in biology or human health medical issues, by his own admission — yet is the Chair of the European Expert Group on cellphone health effects...

Refused invitation

I saw another reference recently noting that both Roger Coghill and Alasdair Philips had specifically been refused an invitation to a three-day World Health Organisation meeting in the UK on 'EMF epidemiology metrics' — i.e., a meeting to think out and plan how EMF signals should be measured, in future EMF related epidemiology studies. This despite the fact that they were co-authors of one of the very few peer-reviewed, published studies which included electric field data logging. Also excluded was US expert on EMF metrics Bill Kaune.

Perhaps it isn't all that surprising the Coghill and Philips were excluded, considering that the meeting was hosted by — you guessed it — the National Radiological Protection Board. All the same, it's a bit dis-

appointing when you consider that it was supposedly an international meeting trying to get the best and most objective advice it could muster, and paid for at the expense of British taxpayers.

Those who weren't refused invitations apparently included representatives from major industry firms Motorola and Vodaphone, people from the UK electricity industry, and many people with no credentials in the field of EMF epidemiology. It's all a bit strange, don't you think?

Revealing patents?

Just before we run out of space this month, another recent and related event that wasn't given much media attention over here was a story that ran in the *London Independent* newspaper, revealing that in the last five years ago various leading cellphone manufacturers have quietly filed patents for various modifications and enhancements, allegedly described in the patent information as 'designed to minimise the health risks' — the same risks that are denied to exist, by the companies concerned.

One report quotes Hitachi as having patented an antenna designed to 'prevent the head of the user from being injured', for example. A spokesman for Alcatel is quoted as saying that the patents are being taken out in anticipation of future changes to health guidelines.

Some EMF-health activists, including Roger Coghill and Alasdair Philips, have suggested that simply by applying for such patents, the companies are implicitly admitting that their present products involve a health risk. However Australian journalist and *EA* contributor Stewart Fist, well versed in this area and hardly a supporter of the cellphone industry himself, points out that this isn't necessarily the case. He suggests that the most likely explanation, and one that they could easily use legally, is that they're merely working towards meeting 'perceived fears in the public'.

Mr Fist suggests that EMF activists really can't promote the idea that standards should be set using the 'precautionary principle' (i.e., taking precautions *before* there's a scientifically 'proven' danger), while also claiming that companies acting in the same precautionary way are thereby admitting liability. He says that if we accept the precautionary principle, we should be *encouraging* companies to reduce the EMF radiation from their products into the user's head — not using such actions against them. Which sounds reasonable, don't you think?

On the other hand, Alasdair Philips has pointed out that some of the companies have not implemented the developments they've patented in their new models as yet, but seem to be quietly keeping them 'up their sleeve' for the future. That's hardly a way of implementing the precautionary principle, or 'responding to perceived public concern', is it? See you next month, I hope. ♦

SEMICONDUCTOR REPLACEMENT PROBLEMS ?

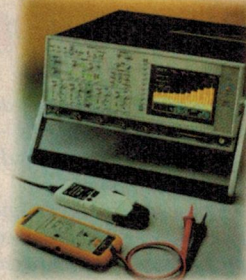
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Serviceman



Who says miniature equipment isn't reliable?

One of our stories this month comes from my own bench, and concerns an early miniature radio that had performed flawlessly for 30 years — and still didn't need much attention. There's also an intriguing tale from the 'back o' beyond' in western Queensland, about a TV set that developed so many weird symptoms the owner thought it had become 'possessed'...

I'VE HAD a little story of my own waiting for space in the column, but I always seem to fill the available space before I get around to my own item. So this time I'm going first!

We tend to think of miniaturisation as a modern phenomenon, based on large scale integration (LSI) chips and surface mount technology. But really, the struggle for ever smaller electronics has been going on at least since the second world war.

The first 'miniature' radio was probably the handheld 'walkie talkie' transceiver, used extensively during the latter stages of the Pacific war. It was the size and weight of a house brick, but was still much smaller than anything that had gone before.

True miniaturisation began with the invention of the transistor, and reached its first peak with the introduction of the integrated circuit. Japanese manufacturers outdid each other trying to design and market smaller and smaller radios, which eventually reached true 'pocket' size.

These ruminations were provoked by a recent repair to one of my own radios. It was a Sony ICR-2100, a truly midget 'AM only' receiver which was probably never sold in Australia. It's still the smallest 'quality' radio I've ever come across and has worked without a sign of trouble for over 30 years. I acquired it this way...

Back in the 1960s I spent some time working in the publicity department of the Tasmanian Government Tourist Bureau. Part of my job was to escort visiting journalists around the State, and on one occasion, in 1967, the journalists were from the Tokyo Television Service.

It's a Japanese custom to give a small gift to your host after a visit and on this occasion, as they took their leave, the leader of the group presented me with a small package which turned out to enclose this little radio.

At that time I had not seen anything remotely approaching the size of this tiny set, and I remember wondering how I would ever service it if things went wrong in the future. In fact, I still haven't seen a radio quite so compact as this, in spite of the advances in miniaturisation in recent years.

For the record, the ICR-2100 measures 70 x 75 x 30mm, and weighs a solid 200 grams when fitted with a 9V NiCad battery. Its active devices comprise one IC

"The first 'miniature' radio was probably the handheld 'walkie talkie' transceiver, the size and weight of a house brick."

and two transistors. The 60mm loudspeaker is the largest component in the set, and everything seems to have been packed in around it using every available scrap of space.

The radio has a surprisingly good tone for such a tiny unit. I don't know what its audio power output would be, but the speaker is rated at 0.2 watts and is quite enough to fill the garden with music when my wife goes weeding the geraniums...

And the job that inspired this reminiscence? I had to fit a new battery snap — the only repair this tiny radio has needed in its 32-year lifetime!

Unusual fixes

Now that I've had my six pennyworth, here's an item from a contributor. It's from Bruce O'Neill, of Griffith in New South Wales. Bruce offers three short stories about TV repair jobs suggesting that component breakdown is not always the cause of obscure failures.

If you can accept that climate, location and pollution can be as much trouble as faulty components, then these stories will confirm your beliefs. Here's what Bruce has to say...

I was encouraged to write to you by the stories from Murphy in June 98 EA. I'm an O'Neill; Irish yes, but not from the same troublesome clan that gives a name to the famous law. I enjoy the Serviceman column and hope that my three fixes are interesting enough to use.

TV Fix one: This took me a very long time to find. After moving from the desert to the seaside, my 15-year-old Rank Arena TV started playing up, usually showing a single horizontal line instead of a picture.

I discovered that the fault was heat sensitive and spent some months, on and off, with the hair dryer and freezer spray trying to find a heat sensitive component. I resoldered many suspect solder joints, but always without result.

Although I didn't find the cause of the problem at that time, I found I could circumvent it by giving the set a few minutes blast with the hair dryer before switching on.

Then I moved inland, and discovered that the fault had changed in that the set worked fine in the warm weather and played up only in the cold. I decided that it was show-down time, so I attacked. I started by

Service man

removing 15 years of accumulated gunk from the circuit boards — but to my surprise, the set then worked perfectly and has continued to do so.

My guess is that the gunk was absorbing moisture from the air and causing the problem.

TV Fix two: About three months after curing the Rank Arena, I was lucky enough to win an NEC 48cm TV, which was given pride of place in the lounge room. All went well until summer hit us. It took two air conditioners to cope with the heat.

Around this time I noticed that sometimes the colours in the top middle of the picture changed. When I moved the set away from the wall to disconnect it, so I could send it back for repairs, I realized that the colour problem had disappeared. Moving it back to its original position restored the trouble.

The problem? Remember those air conditioners? They drew more current than usual in the hot weather and on the other side of the wall, about a foot from the back of the TV, was a big lovely electromagnet in the meter box!

Moving the TV a foot further away from the wall cured the problem permanently.

TV Fix three: Do you need fancy gear to fix a TV? I don't! Just a drill and a screwdriver!

Two weeks ago my better half brought home a 34cm Samsung that she'd bought cheaply from a friend. It had been dropped, but worked fine provided that you turned it off at the power point.

Well, on the first try at our place, it wouldn't work and the former owner came over to see if she could get it going. She had no luck, so the set was moved to another power point, where it worked OK. When it was moved back to the first power point, it continued to work. Well, for two days anyway!

Oh well! Time for surgery! With Mr Samsung face down on the kitchen table, I opened the back quite easily as the bottom two of the four screws holding the case together failed to connect to the front half.

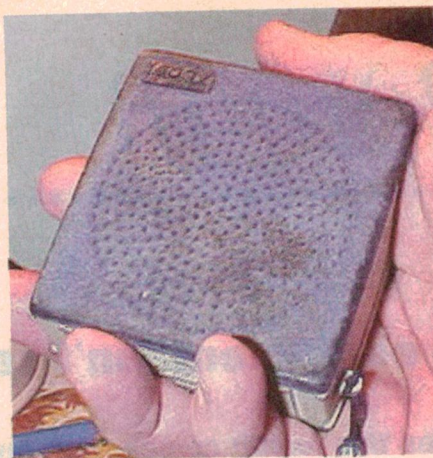
I grabbed the circuit board between two fingers and removed it, only to find that the switches worked fine.

With the bottom half of the case hanging loose, the circuit board could move backwards until the switches would no longer make contact. All I had to do the fix the problem was to drill two new holes in the cabinet to secure the bottom of both halves.

So I fixed a colour TV with a cordless drill and a screwdriver. And now the former owners want to buy the Samsung back. Should we sell it?

I don't think so, Bruce. The value of your labour plus the purchase price should just about equal the present value of the set. No! Keep it, you've earned it.

I can sympathise with your confusion over the Rank's vertical collapse. Anyone would



The Sony ICR-2100's velvet finish case is a bit scruffy after 30-odd years of not always gentle handling, but the little radio still works as well as it ever did. Inside (below) the components are standard sized but packed quite tightly...



be excused for expecting a faulty component. That 'gunk' you found must have had some kind of mineral content to cause quite so dramatic an event. Most house dust is organic and has to be soaking wet before it has any appreciable leakage effect.

And again, moving house and home to the outback is an expensive way to cure a vertical collapse!

Then the electromagnet behind the wall is one I've never heard of before. Hifi speakers — yes. And once, a car that was parked downstairs immediately under the telly. But never before the magnet in the power meter box. That's one for Ripley!

And distorted cabinet backs and missing screws. Well, that is fairly common, but it is still one that can be forgotten in the hunt for more sinister causes.

Thanks for those short items, Bruce. I'm sure that a number of readers will find them of vital interest.

Back O'Beyond tale

Now we come to a contribution from a reader who writes on a letterhead proclaiming 'Back of Beyond Electronics', with an address in Cunnamulla, far west Queensland.

The writer is Lez Morrison, and if you think his story is about the travails of running a business 'Back o'Beyond', then you're quite right. Lez relates problems that you or I never need consider. Here's his story...

I would like to relate to your readers some of the problems involved in the service of consumer electronics that are brought into my service business.

As I am located some one thousand kilometres west of Brisbane, in a town of about 1300 inhabitants amid some 300 rural properties, you probably won't be surprised to know that I have problems with the supply of spare parts etc.

Trying to explain on the phone, to some junior sales assistant, that I don't have a service manual or part number but can describe what I need is costing me the last of my hair!

Where have all of the good spare parts men gone to? As it takes up to two weeks to obtain a service manual, then another two weeks to obtain the parts (if available), it's no wonder that rural repairers seem slow.

It's all very well for the sales assistant to tell me to "just drop in, then we can help you". When I tell them that to 'just drop in' entails a 2000-kilometre round trip, they suddenly fall silent!

The first tricky fault that I will relate to you involved an Orion 26ED colour TV. The customer brought it in complaining that it had 'Gremlins'. As he described the symptoms to me, "At any time it would turn ON or OFF, change channels, colour, brightness, increase or decrease volume..." and so the list went on.

Sure enough, when placed on the bench and switched on, all was well initially. However, even the slightest movement or tap would send it into paroxysms of misbehaviour that led me to believe that I had the dry joint to end all dry joints.

After removing the PCB, which involved taking out about 17 screws in the case rear, I carefully inspected the board for dry joints — but this was one of the best PCBs I had ever seen.

This set is a real problem to service as the tube makes it so front heavy that it tends to fall forward if it's not 'chocked up'.

After much inspection time spent looking without success for the 'dry-joint', due to the PCB being a double-sided through hole plated type, I decided to reinstall the PCB and check more closely with a meter all of the pins on the micro IC, since this is where I suspected the problem to be.

I found that touching any pin on the chip sent the set into its 'mad' routine. "OK!" I said to myself. "Let's pull you out and see what's going on".

As any technician will tell you, removing a 64-pin through hole plated IC can be a tiresome job. Anyway, this was eventually done and the IC was lifted off the board. And would you believe — out rolled a tiny solder ball!

Problem solved, I hoped. Back went the

IC and the PCB was reconnected. After switching on everything worked perfectly. No tapping or movement could cause the problem to reappear. Fault fixed, and several months later the set is still going strong.

Although it takes little time to relate this story, it took much longer to repair the job. As well, I now have on the shelf a little-used service manual. Will I ever see that model again?

Most problems with TV, VCR and microwave oven repairs in the 'bush' are the result of what we in country areas call the 'Customers' Errant Pets'. Mice, lizards etc that make a temporary home in these appliances cause many failures, and as many sudden screams for help. As any country tech will tell you, it's not always a component that causes the failure but just as often, the 'intruder'.

Also with temperatures that in winter may be as low as minus three degrees to summers of up to 50 degrees, chasing 'drift' problems in HF radio equipment also has its headaches.

That's all for now, but I have many other tales that I can let you have when I can find time away from the bench.

Lez, my heart bleeds for you. I know just how you are suffering, since I spent many years working at a distance. Not 1000km, certainly, but still several hundred km from a reliable source of spares. How do you convince a junior sales assistant that a 'trip to town' involves a minimum of a two-day journey?

The one thing in your story that I have not experienced, and never hope to, are those summer temperatures of 'up to 50 degrees'! I begin to get uncomfortable at half that temp, and 35 degrees wipes me out for the day. You are more than welcome to everything you get.

Oh! And thanks for that story. Little solder balls can get into the most obscure places. They can roll around anywhere, but rarely are they big enough to make a sound that might lead you to their presence.

Thanks, Lez, and I look forward to receiving more of those stories whenever you get around to writing them.

Rewarding rescue job

To finish up this month, we have a very short item from Mr J. Francisco, of Alexandria in NSW. Mr Francisco doesn't say if he is a technician, but he is certainly one of my kind; unable to resist the lure of Junque.

As you will see in this little story, you can get lucky when it comes to rescuing gear put out for the Council cleanup:

Some months ago I saw a 51cm TV, in its original carton, on the footpath ready to go to the tip. Believe it or not, the remote control was also in the box.

The set was in very good condition, and looking at it reminded me of your comments about discarded appliances that could have

been cheaply repaired. With this in mind, I decided to take it home and see what was wrong with it.

The set was a 51cm Telefunken Model MP203TXT. On first inspection, I found the power supply fuse blown. A new one also blew as soon as I switched the set on, so it was time for checking voltages.

I could not see anything that could give me a clue about the fault, but I needed a circuit diagram. So I invested \$10 in one and started checking.

After some measurements I found a transistor shorted in the power supply. Another \$20 out of pocket and a new transistor in the set.

Well, I wasn't expecting a great improvement as I switched the set on, so you can understand I was surprised when rewarded with a nice picture. No need for any adjustments whatsoever.

The result of my curiosity and your comments in The Serviceman is a nice 51cm TV, with teletext and remote control, all for just \$30 and a little effort on my part. It also contributed a little to saving the environment, too.

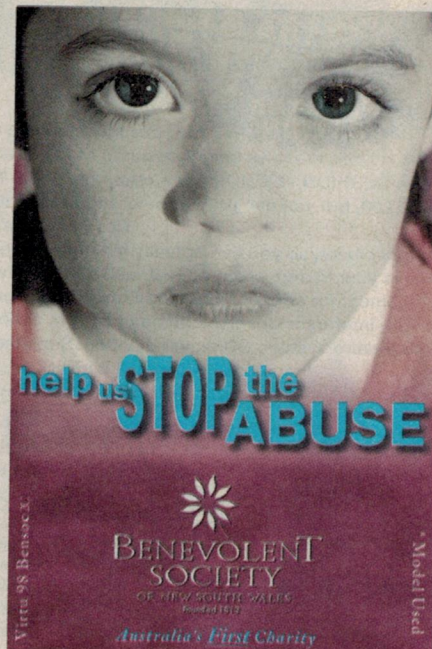
I like to read your magazine and The Serviceman is my priority. I have learned a lot from it. Thanks.

Thanks for your kind words Mr



Francisco, and I hope I have half your luck when next I save something from the tip. Just imagine — 51cm, teletext AND the remote control!

I'm so dispirited, I think I'll finish here and go out to see what I can find myself. See you all next month. ♦



Prices valid until
End February 99

Testing Loudspeakers by Joseph D'Appolito

Testing Loudspeakers - is divided into two broad areas that might humorously be labeled BC and AD. That is, Before Computers and After Digital. Chapters 2 - 5 cover classic analog techniques for measuring impedance. Thiele/Small parameters, low-frequency enclosure alignments, and frequency response using relative simple and widely available analog test equipment. Chapter 6 and 7 cover the use of PC-based electrical and acoustic data acquisition & analysis system in loudspeaker testing. Chapter headings include: • 2-Driver testing • 3-Low frequency system electrical impedance tests • 4-Acoustical testing of single drivers • 5-Acoustical testing of multiple - driver systems • 6- Time, frequency and the Fourier Transform • 7-Loudspeaker testing with PC based acoustic data acquisition systems. This book was reviewed in Speaker Building Magazine No.6, 1998. These are excerpts from the review: "The book fills a real void in technical literature and is packed with useful information. Chapter 2 alone is worth the price of the book. If you are seriously interested in loudspeaker testing. Order a copy." Softcover 280 x 215mm. 174 pages. Cat. BA-1420

only \$69.95

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www.jaycar.com.au**

Jaytech 8 Sector Alarm Deal

Save a fortune by buying our ALARM DEAL using the Jaytech 6000 panel. Includes all the components needed to give you a quality basic home alarm system. All you need is a bit of labour & you have a reliable affordable alarm that offers you peace of mind.

INCLUDES	NORMAL PRICE
1 x 8 sector Jaytech panel	\$129.50
2 x Micron pulse count PIRs	\$53.90
1 x mains power supply	\$23.50
2 x reed/magnet switches	\$9.00
1 x siren horn	\$23.95
2 x deterrent stickers	\$4.00
60 m of 4 core alarm cable	\$51.00
NORMALLY PAY	\$294.85

Cat. LA-5450 **Was \$229 February \$199**

32V 150W Halogen Swimming Pool Light

Are you sick and tired of paying well over \$30 for a replacement globe for your swimming pool light? We certainly were! So we've done something about it. Attention Pool Shops and bulk users - Contact our Wholesale Dept. for fantastic prices for quantity buys. Cat. SL-2725

\$24.95

JC50 10" NEW Speaker Kit

See EA December for details. Speaker kit & built cabinets.

\$869 pair

AURA SHAKER MOTOR ASSEMBLY Cat. XC-1008

An experimenters delight. These units are very similar to those fitted in some really up-market movie theatres. Specifications for the Subsonic Actuator: •Operating Frequency: Subsonic, Max force: 20 foot pounds, Nominal Force: 0.5 foot pounds per watt •Rated power: 18 watts continuous RMS. •250(W) x 300(H)mm •Weight: 1.5kgs

\$24.95

FAST NICAD CHARGER WITH DISCHARGER

The "It does everything charger". Charges AA, AAA, C and D Nicads in 4 hours. See 98 Cat. page 86 for full details. Cat. MB-3500

Normally \$69.95

Only \$49.95

Save \$20!!

New Computer Memory Backup Batteries NEW

AA LITHIUM EXTERNAL BATTERY

This battery (unlike cheaper imitations) uses one AA lithium cell, is encapsulated and designed for external mounting. Its supplied with a lead and Berg flat plug. Voltage is 3.6V, 2.1AH. Supplied with velcro mounting strip. Tadiran brand, size 61(L)x17(H)x16(W)mm.

Cat. SB-2412

\$29.95

VARTA 3.6V NI-MH

Similar to our lithium battery, but this one is suited if a recharging current is fed to it by the computer. Current is 70mAH. Has 2 PC pins for PC board soldering. Size Pin spacing 19mm. 19(L) x 17(dia)mm.

Cat. SB-2428

\$12.95

Don't forget our Lithium 3.6V battery.

Cat. SB-2540

\$11.95

AURA INTERACTOR BODY BLASTERS CUSHION

\$200 LESS THAN 1/2 PRICE FEB \$79.95 \$49.95

We have made a huge distress stock purchase from AURA in USA. We have sold thousands of the Interactor Backpacks, and now can offer a CUSHION VERSION, for a crazy low price. The cushion should sell for well over \$200, but you can grab one - or more, for only \$49.95 each, while stock lasts. **THEY ARE WELL UNDER 1/2 PRICE!** This Interactor Cushion will transform low sounds into movement, so you can actually feel these through your back. Simply place in your lounge chair, or seat, and complete a 3D sound environment for added impact for home theatre, computer games etc. The Interactor Cushion can be used with almost any PC/Mac, home theatre system, CD player or video. Supplied with black cushion (with inbuilt shaker), amplifier module, 240V mains power supply and connecting lead set.

Cat. XC-1005

was \$49.95

FEB \$39.95

Cat. XC-1000

BACKPACK

Put it into computer games, stereos etc, then put the back pack on and feel all the low frequency sounds. See 98 Cat. page 213 for full details.

AURA ADAPTOR CABLE FOR N64 & PLAYSTATION
This pack contains all the leads required to attach the Aura Interactor Backpack to your games console and stereo system. Includes RCA piggyback lead, 3.5mm phone to 2 x RCA adaptor lead, RCA joiners & stereo Hi Fi RCA cable. Total value \$17.40. Cat. XC-1001

\$11.95

OVERNIGHT DELIVERY

AUSTRALEC SWITCHGEAR

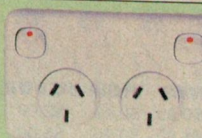
We now stock a range of 240V household power points made by **Australec**. These products are very keenly priced. Bulk users contact our Wholesale Department for amazing new prices.

PRODUCT

Single Power Point	PS-4040	9.95
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Double Architrave Switch	PS-4052	8.50
Single Wall Light Switch	PS-4055	5.95
Double Wall Light Switch	PS-4057	8.95
Protect-A-Point Double		
Safety Power Point	PS-4058	19.95
Double Power Point	PS-4060	11.95
Extra Switch Kit for Double Pwr Point	PS-4061	5.95

PRODUCT

30mm Mounting Bracket - Plastic	PS-4062	3.95
16mm Mounting Bracket - Plastic	PS-4063	3.75
Large Junction Box	PS-4065	4.75
Small Junction Box	PS-4066	4.95
Globe Batten Holder	PS-4070	5.50
Behind GPO Mount Bracket	PS-4077	1.20
Behind Plaster Bracket	PS-4078	2.50
Mains Panel Socket	PS-4090	4.95
Mains Surface Socket	PS-4092	5.50



Passive Infra Red & Microwave In 1

The ultimate in PIRs for home/warehouse burglar alarms. Requires both the PIR and microwave to be triggered at the same time, virtually eliminating false alarms. **Were selling for \$99.50 in 1996!**



10m range for home Cat. LA-5012
Buy 1 for \$55 each
Buy 4 for \$50 each
15m for hallway or warehouse Cat. LA-5013
Buy 1 for \$60 each
Buy 4 for \$55 each

Upside Down Adaptor

Changes the earth pin from the bottom to the top!
 Cat. PP-4028 **\$4.95**



90° Adaptor

Ideal if a plugpack adaptor covers a switch.
 90° to RIGHT Cat. PP-4029
 90° to LEFT Cat. PP-4030



\$5.95 each

2.0uf 250VDC Cap

Our normal price for these is \$2.25 each. We've made a bulk surplus deal, and can offer these at well below normal price. They are white in colour, size 31(L) x 10.5(W) x 20(H)mm. Lead spacing 27mm, lead length 18mm.
 Cat. RG-5176 Pkt 10 for **\$7.95**
 Cat. RG-5177 Pkt 100 for **\$59**



2 New Boxes

SMALL GREY CONSOLE BOX
 Cat. HB-6090
\$9.95

ABS SEALED BOX

Addition to our range. This is now the largest in the range.
 Size 240x150 x90mm.
 Cat. HB-6134
\$29.95



NI-MH RECHARGEABLE BATTERY BREAKTHROUGH!!

•No memory effect •Higher current capacity
 •High drain performance •And now - Lower prices.

AAA 550MAH

Previously Ni-cads were 280MAH

NIPPLE Cat SB-2430 **\$4.50ea**

SOLDER TAG Cat SB-2431 **\$4.75ea**

AA 1000MAH

NIPPLE Cat SB-2455 **\$4.25ea**

SOLDER TAG Cat SB-2457 **\$4.50ea**

AA 1300MAH

NIPPLE Cat. SB-2438 **\$5.25ea**

SOLDER TAG Cat SB-2439 **\$5.50ea**



SOLDER TAG Cat SB-2432 **\$9.95ea**

C SIZE 3300MAH

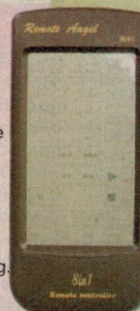
NIPPLE Cat SB-2433 **\$12.95ea**

D SIZE 7400MAH

NIPPLE Cat SB-2434 **\$27.95ea**

Remote Angel Remote Control with Backlight

This must be the ultimate remote control! It is a learning remote control and will operate up to 8 pieces of equipment. It is quite unique in as much as it has a different LCD display for each piece of equipment its controlling. There are 28 programmable visual keys for each individual component. You can teach any command key, any function in each of the 8 devices. AR-1725
Cat. Price \$179.50 Save \$20
Feb. \$159.50



Preprogrammed & Programmable Remote Control

SAVE \$20

This easy to use control does it all. Suitable for TV, Video, VCR, Hi-Fi, Satellite, Teletext. Controls up to 4 units. •Preprogrammed with a huge up to date range of codes. •Learning Capability. This learning function allows you to add these odd functions into the remote. Other features include: •Glow in the Dark •Punch Through •Secondary Function •Anti Shock •Requires 4 x AAA batteries (not supplied). Cat. AR-1705
Was \$89.95 Feb \$69.95



Mini Analogue PIR

See 98 Cat. page 79 for full details. Curtain and long range lens available.
 Cat. LA-5020

Was \$34.95ea.
Feb. \$29.95ea
Buy 5 \$27.95ea

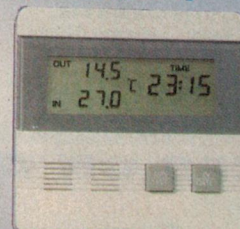


Digital Thermometer With Min / Max Day Date, Memory & Time

This thermometer displays the time (24 hour mode) and inside and outside temperatures in its normal mode. It has a memory which holds the maximum and minimum temperatures reached and the time this happened. Outside temperature probe is on 3 metres of cable.

Cat. QM-7210 **Was \$34.95**

Save \$10.00 Feb \$24.95



Home Theatre Speakers

See Cat. page 44 for details.

CENTRE SPEAKER

Cat. CS-2515



Was \$149 Save \$20
Feb \$129

REAR SPEAKERS



Were \$165Pr Save \$20Pr
Feb \$145Pr

BUY BOTH TOGETHER

	WAS	SPECIAL
CENTRE	\$149	\$129
REAR	\$165	\$145
	\$314	\$274

SPECIAL DEAL \$249 THE LOT

WIRELESS INDOOR OUTDOOR THERMOMETER

Main unit will support up to three main sensors, with high/low alarm for each, min./max. reading (-5°C to 50°C). Remote sensors are splash proof, have their own display, and can transmit up to 30m. The main unit is supplied with one sensor.

WIRELESS IN/OUT THERMOMETER Cat. QM-7220 **Was \$119 \$99**
EXTRA REMOTE SENSORS Cat. QM-7221 **\$49**



SAVE \$20

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OVERNIGHT DELIVERY

SAVE \$\$\$ ON LEDS

DESCRIPTION

				CAT	WAS	NOW	10 FOR
3mm	Red	120mcD	Clear	ZD-1752	\$0.65	\$0.40	\$2.00
3mm	Red	900mcD	Clear	ZD-1753	\$1.00	\$0.70	\$5.00
3mm	Yellow	2000mcD	Clear	ZD-1754	\$1.65	\$1.00	\$7.00
3mm	Green	350mcD	Clear	ZD-1755	\$1.25	\$0.75	\$5.00
3mm	Blue	500mcD	Clear	ZD-1756	\$3.95	\$3.00	\$20.00
5mm	Blue	3000mcD	Clear	ZD-1776	\$12.95	\$9.95	\$70.00
5mm	Green	2200mcD	Clear	ZD-1784	\$7.95	\$5.00	\$35.00
5mm	White	4000mcD	Clear	ZD-1788	\$9.95	\$7.50	\$60.00
5mm	Blue	1200mcD	Clear	ZD-1790	\$4.95	\$2.50	\$20.00
5mm	Yellow	3000mcD	Clear	ZD-1791	\$1.65	\$1.00	\$6.00

WALK BY LIGHT

PIR turns a light on when you walk by. Great for parents in a dark house at night! Requires 4 x D size cells. See cat page 81 for details. Cat. LA-5140

was \$32.95

Save \$12.95
Feb \$20



HALOGEN LAMPS CRAZY PRICES

MR16 HALOGEN LAMPS

Normally \$5.50ea with a glass cover, these do not have the cover. Pay up to \$8 in the lighting shops for these. Limited quantity available. Be quick. Three types available.

- 1) Large 51mm**
12V 20 Watt 38°
Cat. SL-2790
- 2) Large 51mm**
12V 50 Watt 38°
Cat. SL-2792
- 3) Small 35mm**
12V 20 Watt 38°
Cat. SL-2793

only \$3.95ea

REFLECTOR SECURITY BEAM

This security beam uses infra red (IR) which is transmitted to a reflector and back again across a doorway. If the beam is broken by anyone, the buzzer will sound, and only sound while the beam is broken. It is ideal for shops, offices and storerooms etc. to warn of a visitor. The buzzer is on the end of 20 metres of cable, which can be run out the back to the office. The range is up to 7 metres. The transmitter plugs into mains power through a plug pack adaptor (supplied). Cat. LA-5192

only \$119

LASER MODULE

Ideal for experimentors. Includes laser diode mounted on a PCB with a battery spring and on/off switch. Simply connect a 3V battery - negative to spring, positive to case, and you have an experimentors laser. 1mw output. Cat. ST-3115

\$14.95

Military Gas Torch

This Pocke Torch lighter runs on butane gas. The case is clear and it has a piezo start. The flame is adjustable and can be locked off or on. Supplied with a cap on a chain. Height with cap is 76mm.

Only \$29.95

Cat. TS-1684

SECURITY BEAM WITH TRANSMITTER AND RECEIVER

This security beam is similar to the reflector type LA-5192, the difference being it has a receiver unit instead of the reflector. The receiver unit allows the effective range to be as much as 20 metres. This makes this unit suitable for warehouses with large doorways etc. Supplied ready to go with 20m of cable connecting the transmitter & receiver, & 20m of cable for the buzzer. Mains plug supplied. Cat. LA-5194

Only \$139

PIR CCD CAMERA

This is a motion activated camera. When the PIR detects someone, the CCD camera is switched on, and an alarm output is triggered (N/O and N/C 30VDC 0.5A) as well as a light output control (N/C 500W 2.5A).

The turn on time is adjustable, PIR is pulse count - range is 12mt. 110°. Not suitable for outdoors. Size 125(H) x 68(W) x 42(D)mm. Cat. QC-3478

only \$199

SYNCHRONOUS MOTOR DEAL

This small motor is rated at 220V 50Hz and 250RPM. Size is 51 (dia.) x 12 (H) mm. Spindle is 5mm long & 1.4mm dia.

Ltd quantity available.

Only \$5 each



Cat. YM-2702

1 Farad Car Audio Capacitor

See 98 Cat, page 64 for details. Cat. RU-6750

Was \$199

Feb. \$179

Save \$20



Digital Display

Was \$119
Feb. \$99
Save \$20



RU-6751

Cat. ST-3110

MINI SCALE

This digital scale measures from 0-50g with resolution of 0.1g and from 50-100g with a resolution of 0.2g and has a max. capacity of 100g. It also features a tare/net weight function and auto power off. Amazing small size-only 146L x 80W. Calibrated in Australia. Supplied in a pouch. Cat. QM-7248

\$199



DUMMY DOME SECURITY CAMERA

This dummy dome camera looks exactly like the real thing, at a fraction of the price. Make your business/home/office look like its under surveillance. (Even includes the metal camera case inside).

Cat. LA-5315

Only \$39.95

REAL DOME CAMERA

Cat. QC-3472 **\$129**

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LOWER PRICES ON CCD CAMERAS

CCD DOME



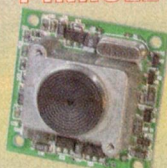
Cat. QC-3472
Was \$139
Now \$129

BOARD



Cat. QC-3460
Was \$125
Now \$109

PINHOLE



Cat. QC-3461
Was \$125
Now \$109

METAL CASE PINHOLE



Cat. QC-3471
Was \$145
Now \$129

METAL CASE



Cat. QC-3470
Was \$145
Now \$129

MAIL ORDER - FREECALL FOR PHONE ORDERS 1800 022 888

Valve Socket Assortment

Your Lifetime Stash

Build that valve amp you've always dreamed about, or perhaps use them to restore an antique radio or Hi Fi. We have accumulated stock from various sources to come up with a definitive valve collection. (Valve sockets are hard to find). The stock was to go towards a valve amp kit project that we have now aborted. Each pack will contain at least 30 valve sockets ranging from 9 pin PCB & chassis mount types (over 1/2 the pack contents) to higher pin types. Some people may even get a 7 pin socket which was common in early battery valve sets. The pack is a great opportunity to source these hard-to-get components at great prices. Stock is new and in excellent condition.

Cat. PS-2065

\$9.95

25MHZ Dual Trace CRO

See 98 Cat. page 28 for full details.
Cat. QC-1900

Was \$749
Save \$120
February

\$629

INCLUDES 2 PROBES



Amplified Walkman Speakers

12 watts PMPO per speaker.
Use 4 C Batteries. Cat. CS-2425

Were \$37.95 Save \$10
Feb. \$27.95 Pr.



Jumbo Computer Speakers

120 watts PMPO per speaker.
Includes 12VDC 2.5A power supply. Cat. XC-5165

Were \$99.95
Feb. \$79.95 Pair
Save \$20 Pair



ADJUSTABLE 50MM DOWNLIGHT

Install your own professional halogen lighting system anywhere you like. Total width at front is 102mm and the depth is 39mm. This holder suits all of our 51mm 12V halogen lamps. Cat. SL-2739

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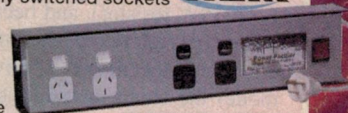


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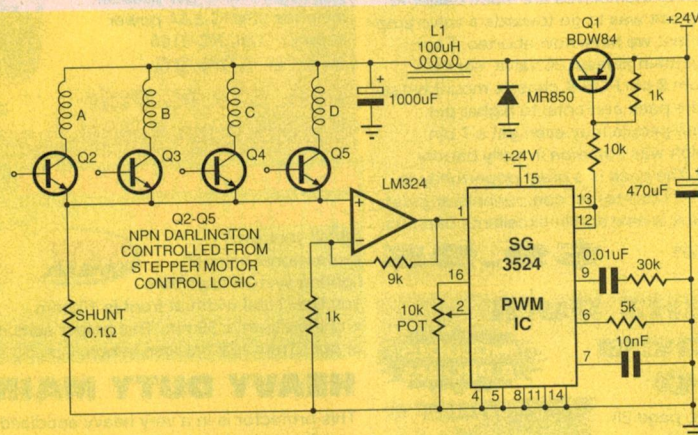
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Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

THIS MONTH'S WINNER!

This voltage is amplified by the LM324 op-amp, configured to give a gain of 10. The 4V output feeds into the negative input (pin 1) of

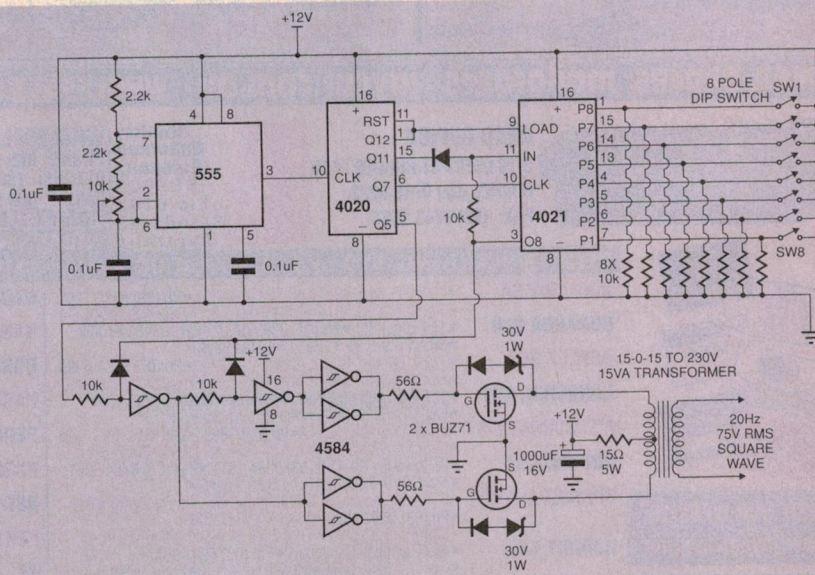


smoothing the supply to the motor. The end result is a controller that ensures that the motor produces a constant and stable torque under load, and also provides a means of controlling the motor current via the trimpot.

Suded Emmanuel
New Zealand **\$40**

Q5, the divide-by-32 output, is at the ringing frequency (20Hz rather than the NZ standard of 25Hz). A 4584 hex schmitt trigger and two MOSFETs are configured as a push-

A ringing timing diagram is at
<http://www.saturn.webnz.co.nz/srtech.htm>.
 Nick Buick
 Dunedin, New Zealand \$40



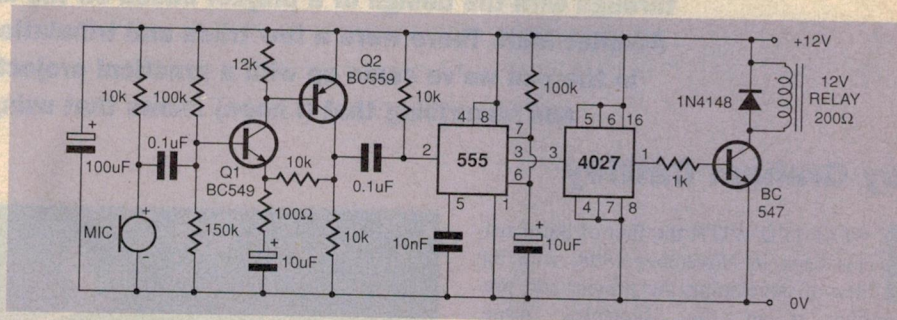
As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is an open order to the value of \$300 from Oatley Electronics! Yes, that's \$300 to spend on anything you want from Oatley's wide range of products, so check out their ad (or their Website) to see what's on offer.

Win our
'IDEA OF THE
MONTH'
Prize!

Clap-operated on/off switch

By clapping in front of the microphone, this circuit can be made to turn just about anything on or off. Q1 and Q2 form a two-stage amplifier with a gain of 100 ($10k/100\Omega$), which boosts the signal from the microphone.

The amplified signal triggers the 555 timer IC, which is configured as a monostable multivibrator. This monostable is used as a de-bounce circuit to prevent the next stage from double clocking on echoes or extended noises. The cleaned up output pulse from pin 3 clocks the 4027 J-K flipflop which, because both its J and K inputs are tied high, toggles its output once for every clock pulse. This then drives the relay via the BC547 driver transistor, with



the diode providing back-EMF protection.

For good directionality, mount the electret microphone inside a 30mm long plastic tube. If you find that the circuit is triggering on normal room noise or is overly sensitive, you

can reduce the microphone's sensitivity by lowering the value of its 10k load resistor to something around 1k.

Pradeep G.

Alappuzha, S. India

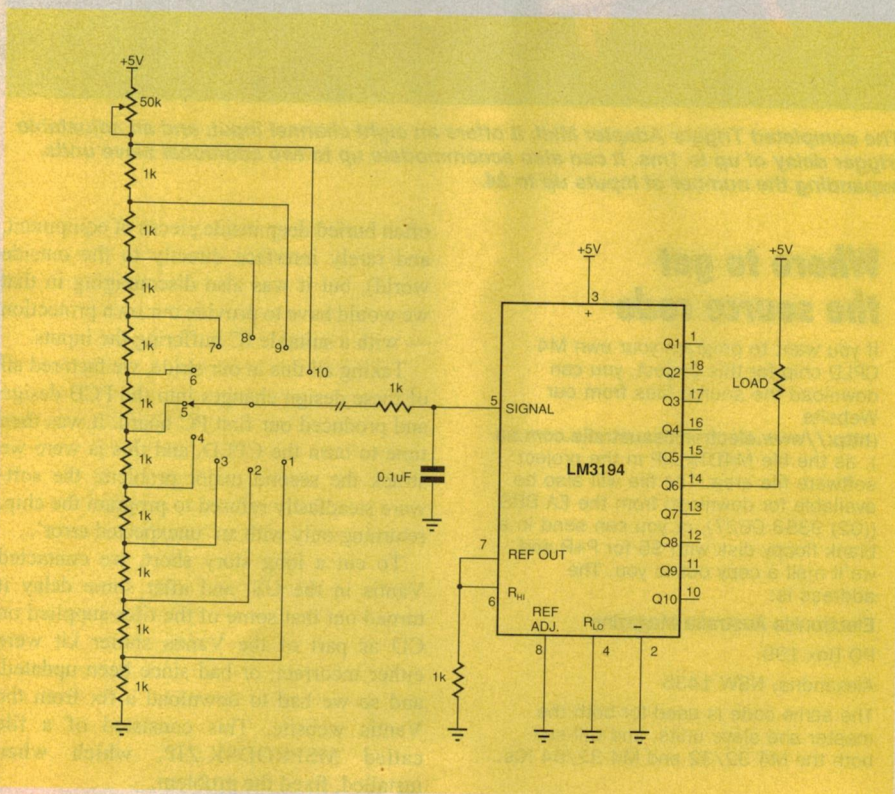
\$30

Two line, 10-channel control

I've had this circuit knocking around for some time now, and its a simple way to switch one of 10 devices remotely, via a simple two-wire link. The circuit's operation is very straightforward, with the LM3914 bargraph IC operating in 'dot' mode.

The chain of 1k resistors sets the 10 differ-

ent voltage levels, with the 50k trimpot letting you calibrate the circuit. As the switch is rotated from position 1 through to 10, the voltage on the LM3914's signal pin (pin 5) rises from 0V up to the positive supply voltage (in this case, from a regulated +5V supply), and each of the chip's outputs come on in turn.



To set up the system, select position 5 on the rotary switch, and ensure that there is a resistive load from Q5 (pin 15) of the LM3914. Then adjust the pot so that the Q5 output is low, and the rest of the outputs should then track correctly. Note that all the LM3914's outputs pull low when active, and that the IC has a degree of output current limiting built in.

Graham Cattley

(EA Staff) ♦

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Putting a CPLD to work - 2

In this second and concluding part of our look at the Vantis CPLD starter kit, we follow through with the design of a project based on the M4 32/32 CPLD — the Digital Trigger Adapter MkII. There were a few trials and tribulations along the way, as you'll see, but in the end we've come up with a practical project that makes good use of the CPLD, and something that (I hope) shows that using a CPLD isn't that scary after all...

by Graham Cattle

I STARTED WITH the first of these articles back in November 1998, with the idea of developing the project and presenting it in the December issue. Unfortunately, a number of small problems conspired to delay the project, but in the process I've learned a lot about using a CPLD in a design, and I hope to pass on my experiences of the various traps, pitfalls and misinformation that I encountered.

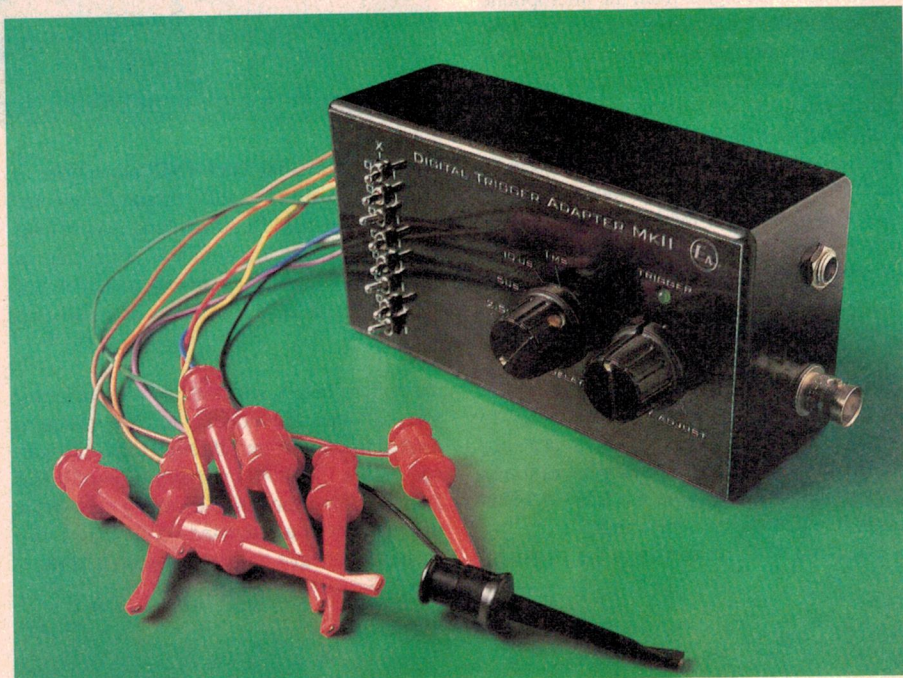
I'll start at the beginning though, with the block diagram of our project — the Digital Trigger Adapter MkII. This was published in the first part of this article, and it shows how the eight INBLK logic blocks feed into a custom made eight-input AND gate entitled ANDBLK. Each INBLK output would swing high whenever the logic level on its input matched the level selected by its associated three-position toggle switch, and the output from the ANDBLK would therefore indicate whether the selected pattern of input conditions had been met.

Redesign details

Our initial information on the M4 32/32 was that every input was pulled down via an internal 50k resistor — hence the 'pull-up' action of the original switching. However we later learned that the internal resistors *are* pull-ups; this meant that the centre pole of each toggle switch had to connect to ground, rather than +5V as was shown. As a result, the original table used as the basis of INBLK needed to be changed, and so in the end we decided to strip out the 'insides' of INBLK, and replace it with the somewhat easier to follow circuit shown in Fig.1.

Another change was needed in designing the 'Trigger' LED output, which originally used three gates as an edge-triggered pulse stretcher to indicate that a trigger pulse had been generated. The chip's internal pull-ups meant that this section of the circuit needed to be 'flipped', with timing components going to +5V instead of ground.

There was also an early suggestion that the M4 32/32 had no ESD protection on its input pins. This was understandable (as CPLDs are



The completed Trigger Adapter MkII. It offers an eight channel input, and an adjustable trigger delay of up to 1ms. It can also accommodate up to two additional slave units, expanding the number of inputs up to 24.

Where to get the source code

If you want to program your own M4 CPLD chip for this project, you can download the source files from our Website (<http://www.electronicsonline.com.au>), as the file M4DTA.ZIP in the project software file area. The file will also be available for download from the EA BBS ((02) 9353 0627), or you can send in a blank floppy disk with \$5 for P+P and we'll mail a copy out to you. The address is:

Electronics Australia Magazine
PO Box 199,
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The same code is used for both the master and slave units, and will suit both the M4 32/32 and M4 32/64 ICs.

often buried deep inside pieces of equipment, and rarely interface directly to the outside world), but it was also discouraging in that we would have to provide our own protection — with a suitable IC buffering the inputs.

Taking all this in our stride, we factored all of these design changes into the PCB design and produced our first PC board. It was then time to burn the CPLD, and this is where we struck the second major problem: the software steadfastly refused to program the chip, returning only with an 'unexpected error'...

To cut a long story short, we contacted Vantis in the US, and after some delay it turned out that some of the files supplied on CD as part of the Vantis starter kit were either incorrect, or had since been updated, and so we had to download a fix from the Vantis website. This consisted of a file called MSPRODSK.ZIP, which when installed, fixed the problem.

Phew! At last the chip was programmed, and after plugging it in and firing up the circuit, we got — nothing. It was a case of back to the drawing board, because when we investigated further, we received a couple of significant pieces of information from Vantis on the latest design of the M4 series of CPLDs...

The first was that the chip's internal 50k pull-ups had been replaced with 'Bus Friendly Technology', which weakly held the input to the last logic level applied. This was a severe disadvantage as far as we were concerned, but the second fact more than made up for it: all of the I/O pins now had ESD protection! This meant that we could now eliminate the buffer IC, but it did mean a complete re-design of the PCB. Ah well!

The circuit

The final result is shown in Fig.2 and Fig.3, with Fig.2 showing the connections to the CPLD IC1, and Fig.2 covering the rest of the circuitry — namely the trigger delay, trigger pulse generator, 'Trigger' LED gating and pulse stretching, and of course the power supply.

In Fig.2 you can see that each of the eight inputs are pulled high via SIL3, an 8 x 100k resistor network that prevents the 'CH x' inputs from floating and preventing false triggering. The other inputs for each channel are 'Set x low' and 'Set x high', and either of these can be pulled low by the associated switch (the pull-up resistors SIL1 and SIL2 are not shown on these other inputs for clarity).

If a level select switch is set to its centre (off) position, then both 'Set' inputs swing high, and in this way each INBLK can tell which of the three input conditions has been selected. (Low, High, or Don't Care.)

When the logic level on an INBLK's input matches the level selected by its switch, its output swings high. The outputs of all eight INBLKs are ANDed together in the AND-BLK logic block, whose output in turn feeds into a second three-input AND gate, used to accommodate the two slave inputs. These inputs are normally held high by R6 and R7, so the 'Event found' signal appears on pin 26 of the IC. Pin 26 drives the Trigger delay circuit (IC1a) directly, as well as providing a 'Slave out' output of the correct polarity.

Moving on to Fig.3, the trigger delay is generated by IC2a, which is simply a monostable that is kicked into action by the 'Event found' pulse on pin 26 of IC1. The delay period is set by SW9a, with RV1 giving you continuous control within each range. At the end of the delay period (anywhere from 1us to 1ms), IC2a's output (pin 5) falls low, triggering IC2b which produces a 50ns pulse on the main trigger output. If SW9 is in the 'No delay' position, the delay circuit is bypassed, and the 'Event found' signal triggers the output monostable IC2b 'directly' via an inverter.

By the way a 74LS123 is used to produce

Fig.1: The 'insides' of our INBLK logic module. Eight of these are ANDed together along with the two slave inputs to produce an 'event found' signal on pin 26, as you can see in Fig.2 (below)

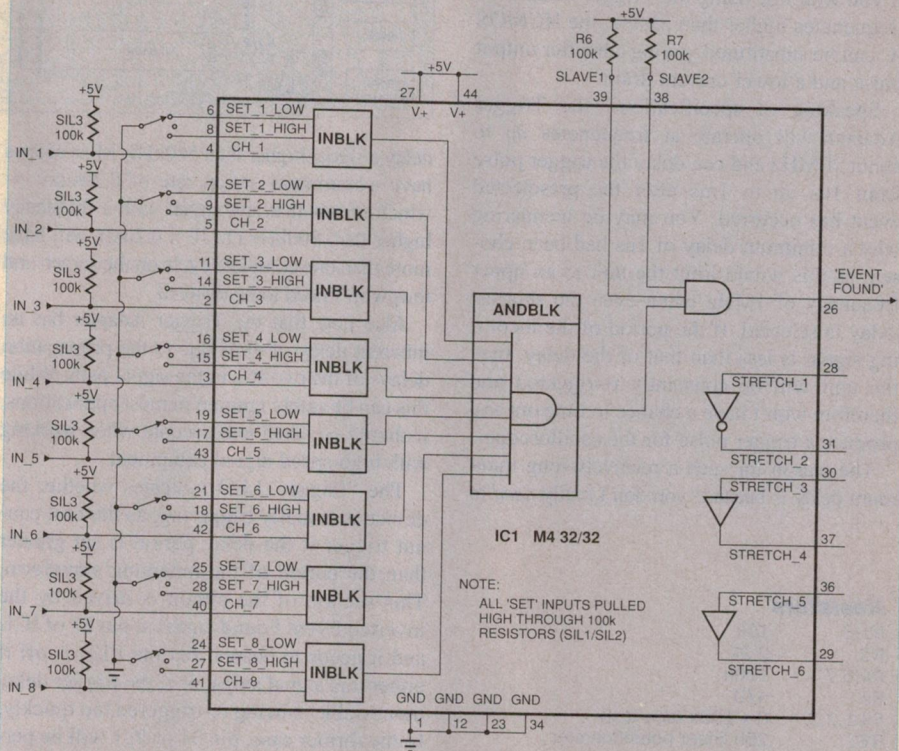
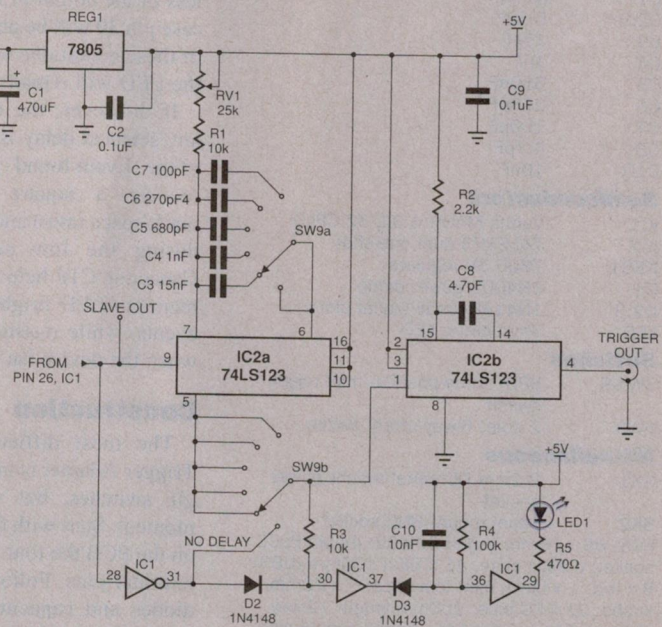


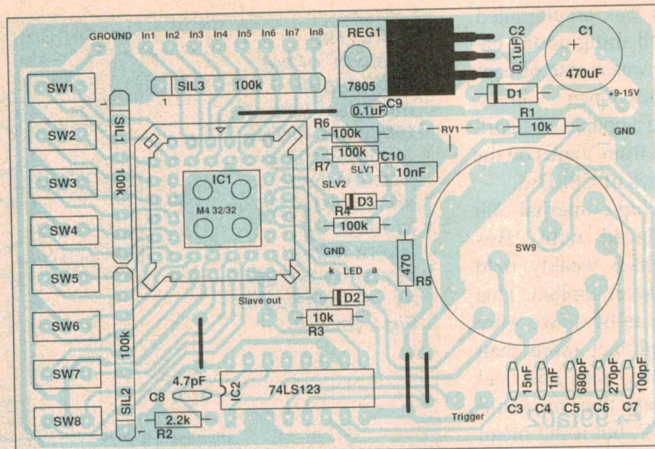
Fig.3: IC2a provides an adjustable delay from 60ns to over 1ms when triggered by the 'event found' pulse from IC1. At the end of this delay period IC2b is triggered, which produces the 50ns output pulse. Note that the inverter and two buffers at the bottom of the diagram are actually part of the CPLD.



the delay and trigger pulses, because it was found that the HCMOS version (74HC123) wouldn't produce a pulse narrower than 200ns. This is a bit limiting, as the upper frequency limit would therefore be around 5MHz. While the LS series IC draws about 16mA more than the HC version and has a poorer output drive, I felt that the higher frequency response outweighed the better output drive, particularly as it would only be driving the trigger input of an oscilloscope. If you won't be using the Trigger Adapter at frequencies higher than 5MHz, the HCMOS IC can be substituted, giving a beefier output pulse and a lower current drain.

Speaking of specifications, the Trigger Adapter will operate at frequencies up to about 20MHz and can delay the trigger pulse from 1µs up to 1ms after the preselected event has occurred. You may be wondering why a minimum delay of 1µs had been chosen, as this would limit the unit to an upper frequency of 1MHz when even the shortest delay is selected. If the period of the incoming signal is less than that of the delay, then the unit will be constantly retriggered and therefore won't have a chance to time out and produce a trigger pulse for the oscilloscope.

The reason for such a relatively long minimum delay is because you don't really need to



It's quite simple to put together — just watch the orientation of the SIL resistor networks, and ensure that the 44-pin PLCC socket is installed the right way round.

delay a signal higher than 500kHz. Most scopes have a minimum sweep rate of 0.2µs/div — which means that any signal with a frequency higher than 500kHz ($1/(10 \times 0.2\mu s)$), will have more than one complete cycle on the screen and thus won't need to be delayed.

Also note that the Trigger Adapter has an inherent delay of 40ns due to the propagation delays of the two ICs in the signal path. While this can be safely ignored in most applications, it should be taken into account when working with high-speed digital equipment.

The 'Trigger' LED indicates whether the device is actually triggering, as the unit cannot trigger if the delay period is set greater than the period of the incoming waveform. This section of the circuit is driven by the inverted Event Found signal at pin 31 of IC1, and it needs to ensure that the LED is off if either this signal stops, or if the trigger delay monostable is being re-triggered too quickly. In the former case, pin 31 of IC1 will be permanently high, forcing pin 30 high regardless of the output of IC2a, while in the latter case pin 30 will be pulled high via R3. Either of these conditions will reverse bias D3, and the LED will remain off.

If, however, the unit is triggering, (and any selected delay is shorter than the period of the 'Event found' pulses), then pin 30 will receive a square wave (of whatever mark/space ratio) and this will light the LED during the low sections of the wave. Capacitor C10 helps to stretch the pulse to maintain LED brightness on widely spaced events, while resistor R4 pulls pin 36 high when the device isn't triggering.

Construction

The most difficult bit in building the Trigger Adapter is in mounting the eight toggle switches, but we'll get to that in a moment. Start with the easy bits by installing on the PCB the four wire links and the 21 PC terminal pins. Follow on with the resistors, diodes and capacitors, and then the SILs. Each SIL should have a dot indicating the common pin (pin 1), so be sure that each of

the three are installed correctly.

By the way if you are unable to get any SIL resistor networks, you can make your own — with eight 100k resistors and a little patience. Use the smallest 0.25W leaded resistors you can, and fit them (plus a short piece of tinned copper wire for the 'common' pin 1 connection) before you fit the toggle switches and CPLD socket...

Now for the socket; 44-pin PLCC sockets aren't that plentiful, and are easy to damage. Firstly, ensure that the socket is orientated correctly, with the chamfered corner pointing to SW1 and SW2. Double check the orientation before you solder, and also check that all of the 44 pins made it through the holes in the board — it's very easy for one to miss its hole and fold over under the socket.

Next install the eight input switches. The board has been designed to accept the more common miniature right-angle PC mount SPDT centre-off switches (SW1-8). These will need to have their leads carefully straightened with a pair of pliers in order to mount them vertically. (Don't worry, the pins are quite robust!) Once straightened, the switches must be carefully aligned on the board as they will have to protrude through the holes drilled in the front panel.

By far the easiest and most effective way to do this is to use a 7 x 60mm piece of thick card or PCB offcut. Simply slide it between two of the switch leads before soldering it in, and they'll all end up the same height. If you only solder the center pin of each switch to start with, you can check that they all line up and make any adjustments before finally soldering the rest of the contacts. (Then remove your guide strip, especially if you're using a PCB offcut!) Finish off with the rotary switch (SW9), the regulator and the off-board components including the two sockets, RV1 and the LED.

The eight test leads are simply stripped from a 250mm long length of rainbow ribbon cable, each terminated with a miniature red test clip. Drill nine 2mm holes in the left hand end of the case, and thread each of the

PARTS LIST

Resistors

R1,3	10k
R2	2.2k
R4,6,7	100k
R5	470
SIL1,2,3	8 x 100k (see text)
RV1	25k linear potentiometer

Capacitors

C1	470µF
C2,9	0.1µF
C3	15nF
C4	1nF
C5	680pF
C6	270pF
C7	100pF
C8	4.7pF
C10	10nF

Semiconductors

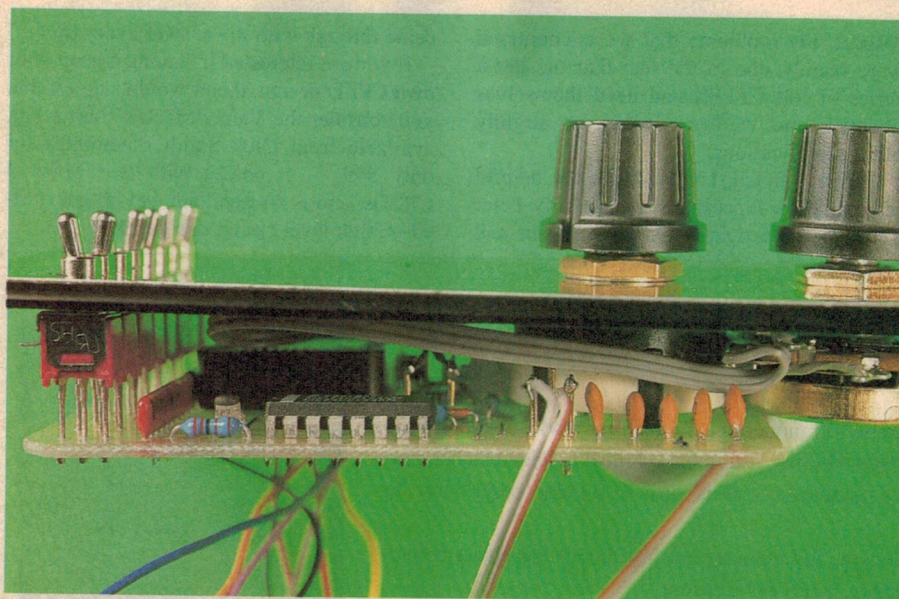
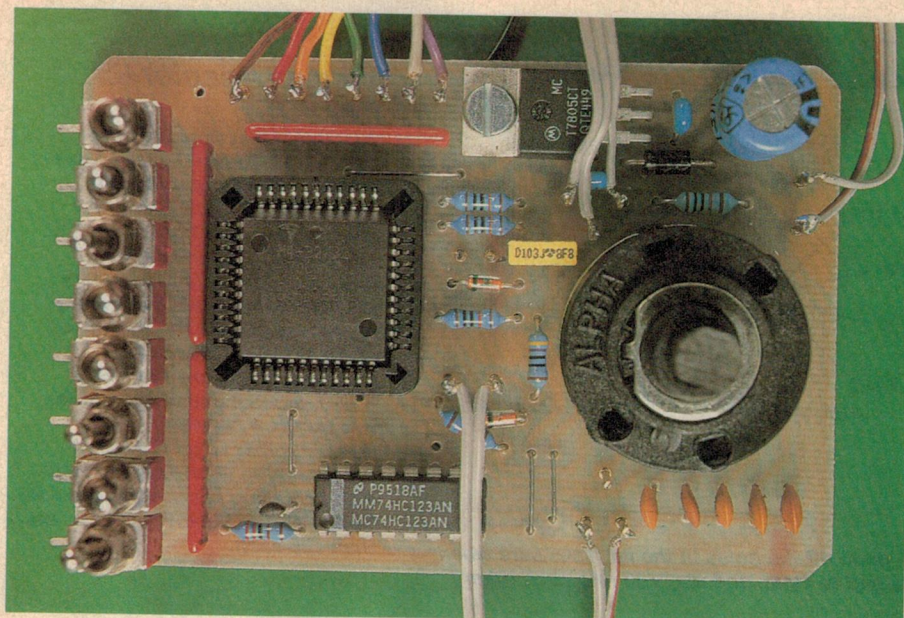
IC1	Vantis MACH 4 32/32 CPLD
IC2	74LS123 dual one-shot
REG1	7805 5V regulator
D1	1N4003 power diode
D2,3	1N4148 small signal diode
LED	3mm green LED

Switches

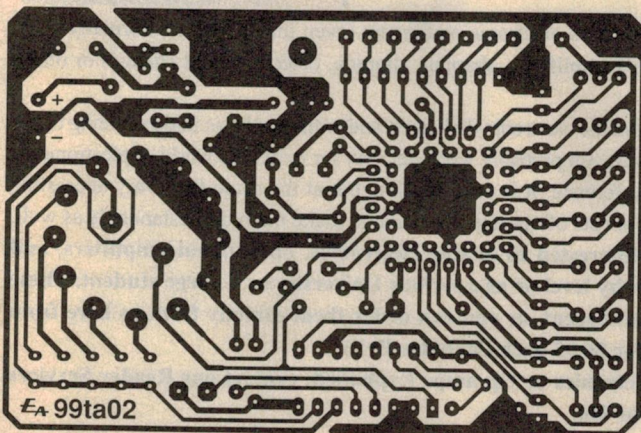
SW1-8	SPDT three-position mini toggle switch
SW9	2 pole, 6-way rotary switch

Miscellaneous

SK1	2.1mm DC panel mount power socket
SK2	panel mount BNC socket
PCB	88 x 59mm coded 99ta02; 44-pin PLCC socket; plastic case, 41 x 68 x 130mm (UB3); 8 x red, 1 x black mini test clips; 2 x 20mm knobs; 21 x PC pins; 250mm length 12-way ribbon cable, hookup wire, tinned copper wire, solder etc.



The top photo is a close-up of the prototype. Please ignore the rather inelegant placement of D2 and R3 — these were repositioned in the final PCB design... The side view of the adapter mounted in the lid (above) shows how the switches are mounted 6-7mm above the surface of the board.



The board for the DTA MkII is a third of the size of the original MkI, and is reproduced here in case you want to make your own PCB.

leads through their respective holes (nine, because you'll want a ground lead as well). You'll also need a couple of holes in the other end of the box for the BNC and power sockets, so you might as well drill them now. If you aren't using a pre-punched front panel, you are up for another 11 holes, eight of which (4mm diameter) are for the toggle switches. These are quite close together, so you're best off taking things slowly and carefully so as to make a neat job of it. Use a photocopy of the front panel artwork as a drilling template.

The PC board is mounted under the lid, with the rotary switch securing one end of the board, and the other end supported by a 20mm spacer mounted on the copper side of the PCB, just above SW1. An alternative and simpler solution is to place a 20mm thick block of balsa wood in the bottom of the box, before you screw on the lid.

Slave units

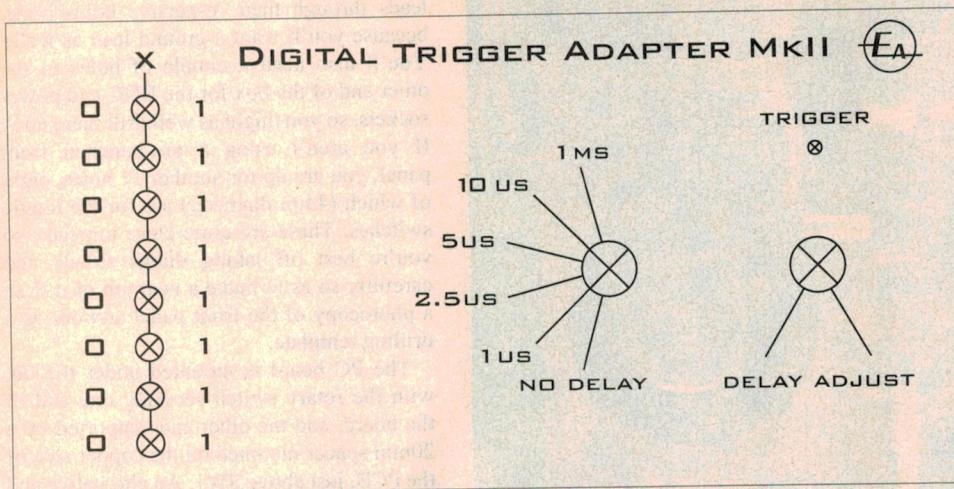
The basic Trigger Adapter has eight inputs. It is, however, very easy to add up to two additional slave units to give a total of 24 inputs, which is very handy for decoding an address as well as a data bus. As the master unit automatically detects any slaves connected (and could also supply power to them), increasing the number of inputs is as simple as plugging in another unit. While there is only provision for two slaves to be connected, there is no real reason why more couldn't be added in conjunction with a little thought and an 74HC32, to give as many inputs as required.

Construction of a slave unit is quite straightforward, as much the same circuitry is used as that in the master unit. You can leave out all the components in Fig.3, except for the two bypass capacitors C2 and C9, which should remain, along with the wire links. Needless to say a slave unit *does* need its own CPLD, wired as shown in Fig.2.

A slave unit could be connected to the main Trigger Adapter by a short length of ribbon cable terminated in a five-pin DIN plug; there are only three connections, for +5V, ground and the slave's Event Found output. But I'll leave the physical details to your ingenuity...

The completed Trigger Adapter can be easily tested by setting one of the inputs to '1' with the remaining switches set to the centre 'X' (Don't care) position. by injecting the active input lead with a digital square wave, the trigger LED should light, indicating that the input section is detecting the signal and that the trigger pulses are being produced.

Due to the Adapter's 100k input impedance, you should ensure that all unused input switches are set to the centre position in normal use, to prevent false triggering due to stray electrical noise.



Use a photocopy of this front panel artwork to mark off the holes in the lid. Take care when doing this, as the switch holes need to be enlarged to 4mm, and may run into each other unless accurately drilled.

Summary

Well, there it is at last. There were a few stumbling blocks to start with, but in the end the M4 32/32 provided a neat solution to the updated Trigger Adapter project, resulting in something around a third of the size and with significantly fewer components. In ret-

spect, the problems that we encountered were mainly due to the fact that the latest series of M4 CPLDs had been themselves updated, and we were going on slightly older specifications.

Before I finish, I must thank the helpful team at BBS Electronics, particularly Peter Tan, who investigated all our problems and

came through with the answer every time.

If you are interested in having a go at your own CPLD design, then I would suggest that you consider the Vantis Mach 4 Starter Kit, available from Dick Smith Electronics for only \$99 — it comes with two Mach 4 CPLDs, and is an excellent way to get started in high level circuit design. ♦

Trigger Adapter kit from DSE

Dick Smith Electronics will be selling a kit for the Digital Trigger Adapter, as well as selling the Vantis Mach 4 CPLD Starter Kit referred to in part 1 of this project. The Digital Trigger Adapter kit (Cat# K-1460) will sell for under \$60, and will include everything except the CPLD. The Starter kit (Cat# K-1450, \$99) contains software, cable, programming board, manual and also includes two MACH 4 devices. If you'd rather forgo the job of programming your own, DSE will also be selling pre-programmed M4 32/32 CPLDs (Cat# K-1461) for less than \$20 each.

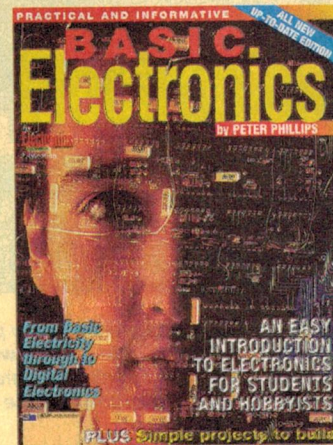
Two new publications available from Electronics Australia

Basic Electronics

AT LAST there's a new and easy to read introduction to modern electronics for students and hobbyists. The author is well known technical writer Peter Phillips, a former technical college teacher who has produced many award-winning electronics textbooks and is also a regular contributor to Electronics Australia.

Peter's new book is written in an easy to read style, and includes not just theory but also a collection of simple construction projects, to give valuable 'hands-on' learning.

The book is designed to give you a good grounding in all of the basics of modern technology, with the 20 chapters covering everything from resistors to thyristors, batteries to power supplies and diodes to opto-electronics.



Op amps Explained

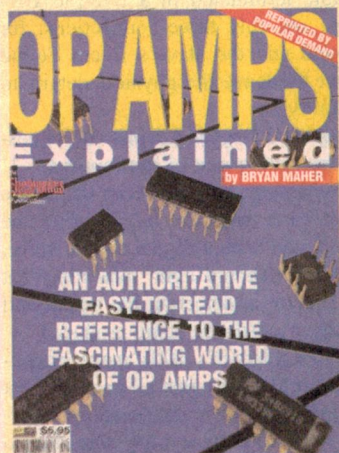
LOOK INSIDE almost any piece of modern electronic equipment (even things that are normally 'digital'), and you are likely to find op-amps amplifying, shaping, clipping, detecting level changes or otherwise processing signals.

Without op-amps, we'd still be stuck in the electronic dark ages, and without a basic understanding of the way they work, and the way they're used, you probably won't get very far in today's world of electronics.

This book can be your guide and reference: it is authoritative, but at the same time very accessible - and it gets right down to the very concepts of op-amp operation to make them understandable as well.

We recommend it to everyone interested in analog electronics, operational amplifiers, and their applications, whether at a hobby level or as a serious University or College student. These are both on sale at your nearest newsagent, or you can order them directly from us here from our Reader Services Department for \$6.95 each (includes P+P).

To order your copy of Basic Electronics or Op amps Explained, contact our Reader Services Department via email, or by mail or fax.



MicroGram Computers

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Cat. 3379 Headset - Ear (Either) & Mic ANC500 \$78
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The PHL1600 terminal is a programmable handheld terminal with a compact body, well suited for a variety of indoor portable applications. A rechargeable battery pack, that

can be charged in the cradle, or non-rechargeable penlite batteries can be used. Through an IrDa interface the terminal is able to communicate to the cradle, or apart from the cradle to all computer devices that use IrDa communication, like portable computers, notebooks and organizers.

Cat. No. 8526 Portable Bar Code Laser Scanner \$2190
Cat. No. 8527 Portable Bar Code Cradle \$625

Printer Sharer



Share up to four printers between 40 computers. Transmits data up to 400m at 10,000 characters per second over 6 wire telephone cable, (a 6m length is included). A small 4 way switch attached to a short length of cable allows the desired printer to be selected.

Cat. No. 12029 Printer Extend - Computer End \$59
Cat. No. 12030 Printer Extend - Printer End \$59

Ethernet Hubs 10/100 BaseTx

Each individual port on these dual-speed hubs provide 10/100Mbps Auto-Negotiation function which automatically senses & selects the optimum speed at 10Mbps or 100Mbps. Internal switching function allows communications between 10Mbps ports and 100Mbps ports within the same hub, ideal for mixed speed network environment. A 4-port 100Mbps Fast Ethernet palmtop hub is also available.

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\$10 Wonders

20 — Novelty Nightlight

This is a battery-powered nightlight suitable for the bedside of a young child. The exact form, ornamental or purely functional, depends on your preferences and skills. The one illustrated here is for children of the sailing fraternity and, although it takes some liberties with the rigging, is easily built from a few scraps of plastic sheet and tubing.

BEING BATTERY-powered, this nightlight is intended to stay lit only for as long as the child normally takes to drop off to sleep. But it does not plunge the room into darkness without warning. It has two tiny lamps, and both of these come on to start with; one then goes out after about six minutes, while the other goes out around three minutes later. You can make the times longer or shorter simply by altering the values of the timing resistors or capacitors.

If junior wakes later in the night, pressing the button for an instant starts the lighting cycle all over again. In this respect, the circuit is not suitable for babies; but in a later issue, we shall be presenting a \$10 sound-operated trigger switch that puts the light on at the slightest cry or shout.

How it works

The circuit is based on a single IC, the 7556, which comprises two 555-type timers (Fig.1). If you have a pair of 7555s in your parts box you can use these instead, but note that you must use the CMOS versions (type number beginning with 7, or occasionally with other designations such as TLC556).

The TTL versions, plain 555 and 556, take too much quiescent current to be suitable for a battery-powered project.

The timers are wired as monostables, triggered together by momentarily bringing their trigger inputs low. Their outputs, normally at 0V, then rise to the positive supply level for a period of time depending on the values of the timing components. At the end of the period the outputs go low again and stay low until the timer is retriggered. The single high output pulse is the reason that the circuit is called a monostable.

The length of the pulse depends on the values of the timing resistor and capacitor, and is given by:

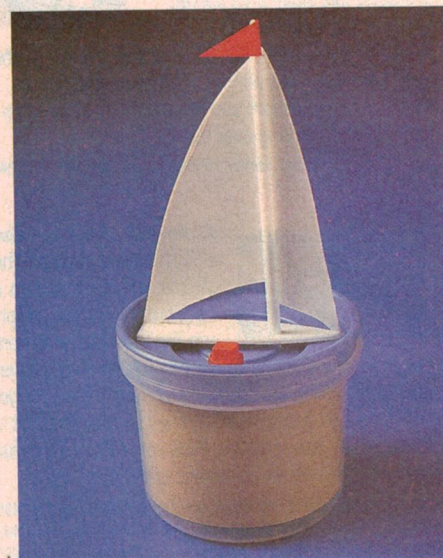
$$t = 1.1RC$$

where t is the length of the pulse in seconds, R is the resistance in ohms, and C is the capacitance in farads.

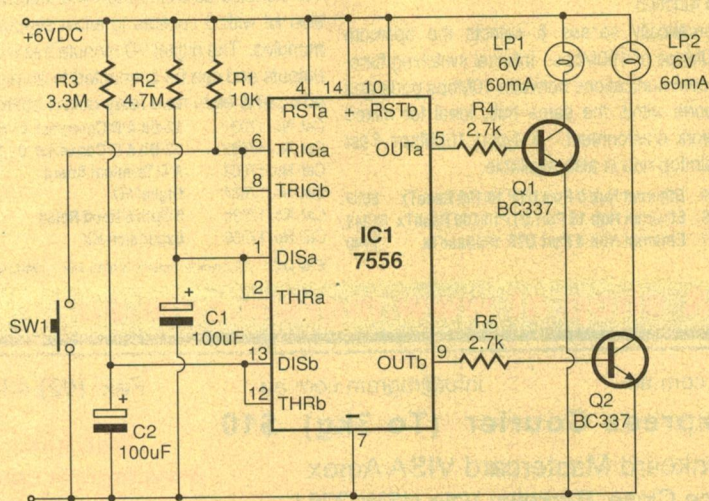
For the timers in Fig.1, the pulse lengths are:

Timer 1: The resistor is R_2 and the capacitor is C_1 . $t = 1.1 \times 4.7 \text{ megohm} \times 100 \text{ microfarad} = 517\text{s}$.

Timer 2: The resistor is R_3 and the capacitor is C_2 . $t = 1.1 \times 3.3 \text{ megohm} \times 100 \text{ microfarad} = 363\text{s}$.



Sailing, Sailing, over the bounding waves... You can't see them here, but mounted on the back of the sails are a couple of miniature bulbs, activated by the red button that looks remarkably like a navigation buoy...



The pulses are therefore 8.6 and 6 minutes respectively.

That was the theory, now the practice. The first problem is that electrolytic capacitors have a tolerance of up to $\pm 20\%$. A so-called 100uF capacitor may have a capacitance as low as 80uF or as high as 120uF. It is therefore possible for Timer 1 to produce a shorter pulse than Timer 2! In the prototype, Timer 2 was about right, but Timer 1 ran for 11 (instead of 8.6) minutes.

This isn't all; electrolytic capacitors have high leakage, but the equation above assumes no leakage. When high-value

Fig.1: It's a simple circuit, with the two timers in the 7556 set to run for 9 minutes and six minutes after the button is pressed. Q1 and Q2 buffer the timer's output, and can handle lamps that draw up to 800mA.

Also in this issue:

- Tektronix New TDS-3000 DPO Oscilloscopes
- Electronics WorkBench V5
- Full Function, Handheld DMM & Scope
- 2GHz RF Field Analyser

EMONA News

EA Edition

Volume 14 Number 1 1999

Test equipment & software for industry, education & enthusiasts.

Pen Scope

Pen Sized 20MS/s Storage Oscilloscope & DVM with PC Link

osziFOX
\$249
\$293 Incl. Tax

The osziFOX is a microprocessor-controlled oscilloscope and digital voltmeter housed in a small probe with a backlit mini LCD display. All oscilloscope parameters are menu driven and selected by pressing one of two push buttons. You can quickly and single-handedly set all parameters while looking at the point of measurement, the probe's controls and the display.

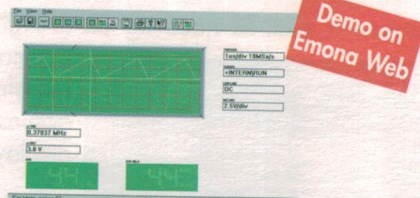


Once oscilloscopes were heavy and clumsy to handle, but over the years they have got smaller and smaller. The latest development in this field has just arrived: a digital storage oscilloscope in a slim housing scarcely longer than a pencil and about as thick as your thumb.

Despite its small size, its performance can match that of a service oscilloscope. With a sample rate of up to 20MS/s, even signals in microprocessor circuits can be recorded. Using the digital voltmeter function, AC and DC voltages can easily be measured.

The osziFOX has many uses. It can be used for making measurements in amplifiers, digital circuits, telephone installations, hobby electronics, production line tests, servicing and on the spot measuring.

Windows, recorded signals can be displayed simultaneously on a PC screen via the serial interface.



For documentation purposes, the recorded signals can be saved to disk or printed.

osziFOX Overview

- Sample rates: 50ns to 1ms
- Input ranges: 1V, 10V, 100V
- Input: 1, 1MΩ AC/DC coupled
- Trigger: Int & Ext, positive or negative
- Trigger levels: 6, selectable
- Resolution: 6 bit
- Buffer size: 128 bytes
- Voltmeter: AC/DC
- Display 16 x 32 Backlit LCD
- PC interface: serial port
- All cables and software supplied as standard

With the supplied software for DOS and

HV Supplies

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The Spellman SL-series of compact 10W to 1200W high voltage power supplies provide a very well regulated, low ripple, variable output high voltage in a highly efficient, compact design.

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- Low EMI/RFI
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- Regulation 0.005%
- Stability 100ppm/hour

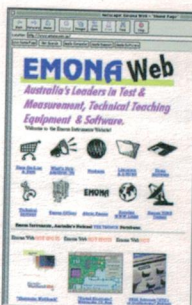


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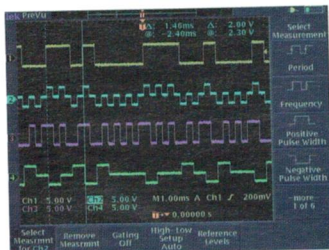
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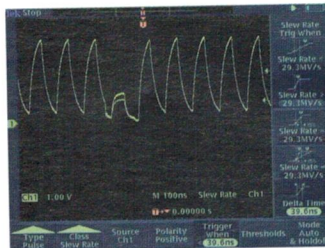
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This is the Future in Oscilloscopes

Better than analog and better than digital, the DPO scope is a blend of the qualitative and quantitative performance of both traditional types of scopes.

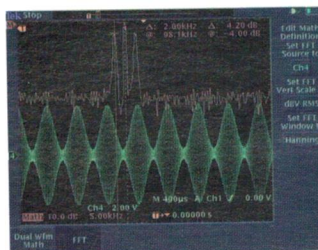


But the DPO goes further. While analog scopes can display the intensity information of a signal, they can not store or analyse them. The DPO delivers both the real-time response like its analog counterpart plus the ability to capture signals.

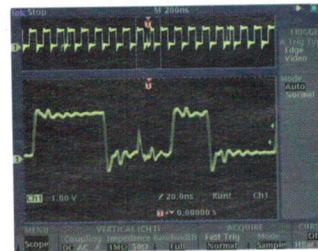


In addition to being protected from the

digital aliasing to which digital scopes are susceptible, DPOs will much more easily capture infrequent signal events. Any and all complex signal behaviour, such as video signals or high speed anomalies on digital waveforms, are accurately displayed.



Now its possible to capture elusive signals that analog and digital scopes simply overlook.



What's more, the DPO is able to deliver real-time performance, creating a live display of actual signal behaviour.

Digital Phosphor Technology Explained

Digital Phosphor Oscilloscope (DPO) technology digitally emulates the chemical phosphorescence process that creates the real-time behaviour and intensity grading in an analog scope's CRT.

In a DPO scope, the incoming signal is **continuously** acquired and routed directly to the display. Instead of serial data processing, as in traditional digital scopes, the DPO's post-processing μ P operates in **parallel** with the Digital Phosphor circuits.

The DPO displays, stores and analyses signals in real time, using three dimensions of signal information: **amplitude**, **time** and **distribution of amplitude over time** (just as seen on analog scopes).

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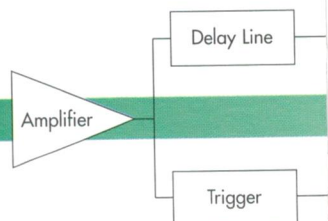
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Floppy disk drive &
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standard

Tektronix DPO display technology - achieved through unique high speed

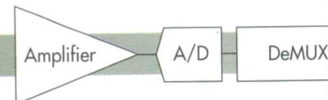
ANALOG SCOPE

(1940's)



DIGITAL STORAGE

(1970's)



DIGITAL PHOSPHOR

(1999, Tektronix)



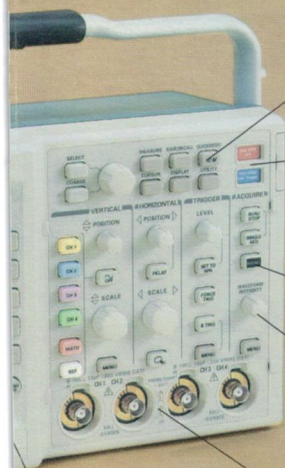
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100 DPO scopes



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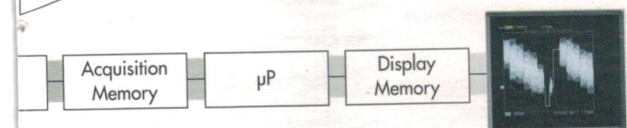
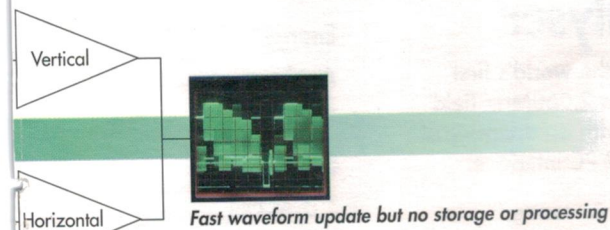
Auto-set

Waveform INTENSITY knob - controls waveform intensity like an analog scope

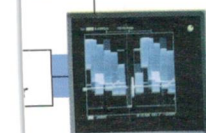
6 models
100, 300, 500 MHz
2 and 4 channels

Tektronix

analog scope waveform display and parallel processing technology



The DSO's serial processing of acquired data causes a lag in response and losses in display of fast changing signals

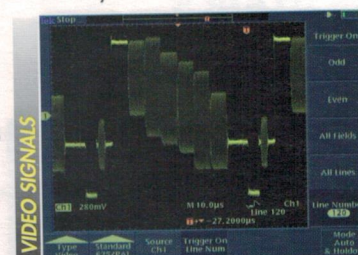


Includes the fast waveform update of analog scopes plus the advanced capture functions of digital scopes & more

Exceptional Performance

The TDS-3000 family delivers bandwidth and acquisition capabilities usually associated with high performance R&D instruments.

Depending on the model, these scopes offer a full 100MHz, 300MHz or 500MHz single-shot bandwidth, simultaneously across 2 or 4 channels.



TDS-3000 Series Overview -

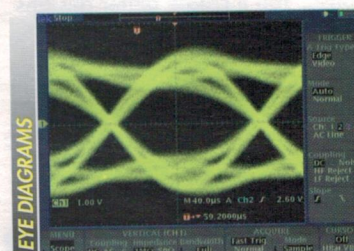
Model	Bandwidth	Channels	Sample Rate
TDS-3012	100MHz	2	1.25GS/s
TDS-3014	100MHz	4	1.25GS/s
TDS-3032	300MHz	2	2.5GS/s
TDS-3034	300MHz	4	2.5GS/s
TDS-3052	500MHz	2	5GS/s
TDS-3054	500MHz	4	5GS/s

Prices start at only \$5,385, excluding sales tax.

Easy Expansion & Customisation

To extend the TDS-3000's capabilities, users can easily install optional application modules. Up to four modules can be used simultaneously. Three modules are currently available:

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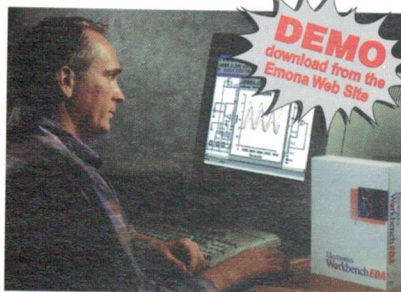
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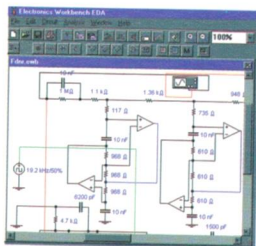
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- Scope
- Timer
- Counter
- Generator
- Automotive

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Generator

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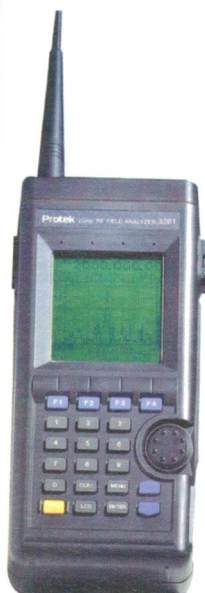
Operation

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WENS Precision

2GHz RF Field Analyser



The Protek 3201 is the world's first handheld 100kHz to 2,060MHz field strength analyser, with an accuracy of 25ppm, and RS-232 PC interface.

The 3201 is designed for testing, installation and maintenance of mobile telecommunications systems and TV antenna installation.

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Protek

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resistors are being used to produce long times, an appreciable proportion of the small current passing through the resistor to charge the capacitor leaks through the capacitor to ground. So it takes longer than expected to charge the capacitor and the pulse is longer than the equation indicates.

The only thing to do is to try out the circuit with the capacitors you intend to use and check that the pulses are suitable lengths. It can happen that with a high-value capacitor and resistor combination, the leakage is so great that the capacitor never charges sufficiently to bring the pulse to an end.

Bearing the above remarks in mind, you can calculate values for periods shorter or longer than the ones recommended here. The minimum recommended resistor value is 1k and the maximum is 10M. The maximum capacitor value is limited by leakage, as explained above. One way of minimising leakage is to use a capacitor rated at a working voltage higher than actually used in the circuit. Higher working voltage means a bigger and more expensive capacitor, but leakage is much reduced. Typically, leakage drops to a tenth when the operating voltage is only 40% of the working voltage rating. In this circuit, a working voltage rating of 16V or more gives much lower leakage.

Construction

First decide on what model, if any, will decorate your project. It can be a graceful yacht, as in the photo, a mushroom with a pixie sitting on top, a fairy doll, or a hovering helicopter. You may prefer to make it yourself but, if not, there are plenty of suitable trinkets in the novelty/gift shops.

Then decide on the enclosure. The prototype uses a circular plastic food container from the local supermarket. The blue lid represents the sea.

Next decide on the type of lamp. The prototype uses two 'grain of wheat' lamps which take 60mA at 6V. Alternatively, use a pair of 6V 100mA MES globes. Many of the lamps available are actually rated at 6.3V, so they will be slightly under-run but still suitable for a nightlight. On the other hand, if you want a really dazzling display (but not on our model yacht, please!) you could use certain types of automobile

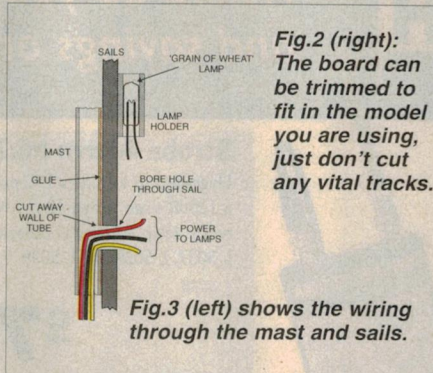


Fig.2 (right): The board can be trimmed to fit in the model you are using, just don't cut any vital tracks.

globes, as the transistors can take up to 800mA each. Using more powerful lamps would make the project suitable for a time-limited corridor light or porch light.

Having decided on the lamps, their volts and milliamps, the final decision is how the circuit is to be powered. The circuit takes 18mA when quiescent and up to 200mA when the lamps are on. At this rate, a pack of four AA cells (2.6Ah) lasts for about 10 nights, running for 12 hours per night. It is cheaper to use a pack of four D cells (15.6Ah). It is cheaper still to use rechargeable cells.

If battery power is not important, the cheapest long-term solution would be a plug-in mains power supply unit delivering 300mA at 6V DC. It need not be a regulated supply. If you already have such a unit but it does not give 6V, the circuit itself runs on any voltage in the range 3V to 15V DC (note the DC), but you will have to use lamps intended for the changed voltage.

Cut the circuit board to fit into the bottom of the enclosure, where it will eventually be fixed by a lump of Blu-Tack. The circuit layout (Fig.2) fits into a board of almost any shape.

Assemble the complete circuit, noting the places where the copper strips are cut beneath the board and where solder-blobs have been used instead of wired connections. Test the circuit with the pushbutton and lamps temporarily connected. The next step is to wire the circuit into the model.

The model

Readers may need to adapt these instructions to suit their own models. The push switch is mounted on the lid of the enclosure. It has

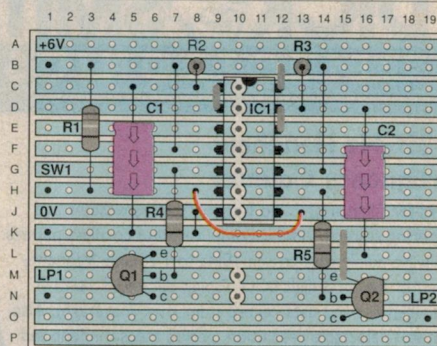


Fig.3 (left) shows the wiring through the mast and sails.

four pins at the corners of a 5mm square. Drill four 1mm holes in the lid, glue the switch to the lid (using all-purpose glue such as 'Uhu' or a contact adhesive) and solder the switch connections to two of the pins. Use a resistance range of your multimeter to find out which pair to use.

The model is cut from a 2mm sheet of high impact polystyrene. This is easy to work with, and is on sale at model shops. Draw the shapes of the pieces with a pencil, and use a sharp craft knife to cut along the outlines.

The sails are cut in one piece and shaped so that they dip down to touch the hull at the bows and stern. The mast is cut from polystyrene tubing 4.8mm diameter (also from model shops), and is long enough to project 20-30mm below the lid. Cut away a small piece of the mast about half way along it to allow the wires to come up through the mast and pass out through a hole in the sails (see Fig.3).

Before sticking the mast to the sails, thread three wires through the sails, then through the hole in the mast and down to the bottom end of the mast. Then stick the mast to the sails, using an adhesive suitable for polystyrene (Precision Poly Cement, by Humbrol). It should dry in about 30 minutes.

To fix the lamps to the rear of the sails, use two 14mm lengths of the mast tubing as lamp-holders, and glue these to the sails. Push the lamps into these, cut their wire leads to about 10mm, and solder the power wires to these. Gently pull the wires down through the mast to leave them fairly flat against the sails.

Cut a 5mm hole in the hull to take the mast, and a similar hole in the lid of the enclosure. Push the mast down through the hole in the hull, and then glue the tips of the sail to the bows and stern. Leave to dry, then glue the whole assembly to the lid. The burgee (flag) is cut from coloured paper, stuck to a polystyrene cocktail stick, pushed into the end of the mast and glued there.

Drill a hole in the enclosure for the main power lead, and then complete the connections to the circuit board. You may prefer to leave the 'works' exposed, or hide them with a strip of coloured paper wrapped round inside the enclosure. ♦

Parts List

Resistors

Carbon 5% 1/4 watt
R1 10k
R2 4.7M
R3 3.3M
R4,R5 2.7k

Capacitors

C1,C2 100uF, electrolytic, axial, 16VV

Semiconductors

IC1 7556, CMOS dual timer
Q1,Q2 BC337 NPN transistor

Miscellaneous

SW1 PCB mount pushbutton switch
LP1,LP2 6V filament lamps, any suitable type
Holders for lamps (if required), scrap of stripboard, 5 x 1mm terminal pins, 14-pin IC socket, materials for model.

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Ideal for measuring radio frequency transmissions and servicing stereos, videos, computers and cordless phones. This incredibly easy-to-use 10Hz to 1.25GHz frequency counter has an 8-digit LCD display, data hold, relative management and data record (min, max & average). Also features selectable resolution, period measurement and more. Complete with telescopic antenna and BNC to alligator-clip leads.

Q 1322

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Designed for industrial and HVAC applications with safety in accordance with IEC1010-1 installation category III for 600V. Features 4 digits 9999 counts resolution, data updates 4 times per second, bargraph updates 20 times per second, four selectable sensitivities on frequency. Record maximum, minimum, maximum to minimum, average. Relative zero, data hold. Auto power off. DCV 999.9mV to 600V. ACV 999.9mV to 600V. Resistance 999.9Ω to 40MΩ. Temperature -20°C to 500°C. Capacitance 1.000μF to 10.00mF. Frequency 9.999Hz to 50kHz. Fast audible continuity. Diode test, splash proof and more.

Q 1566

\$179

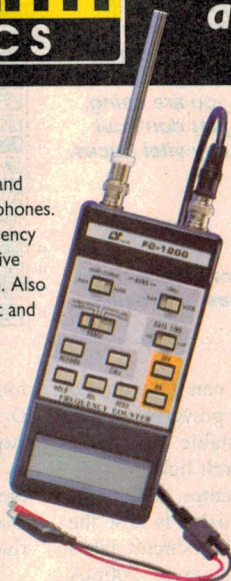


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L 5033

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- An updated version of the 1995 Digital Trigger Adaptor (DTA), utilising a complex programmable logic device (CPLD)
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K 1460

This kit does not include a CPLD chip.
Please read on...

If you have bought the Vantis starter kit, (K 1450) you can use the chips included and program them using the files included on floppy disc in the DTA kit. However, if you simply want to buy the kit and not worry about programming etc, then you have an option of a pre-programmed M4 32/32 chip – simply insert this into the assembled DTA kit for immediate use.

K 1461

\$59⁹⁵

\$19⁹⁵ ea.



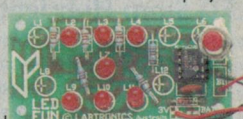
Feb '99

PIC-based LED Fun Kit

- Have fun and learn about Microcontrollers at the same time
- One board lets you construct 8 different projects, including a timer, dice roller, mini alarm and more!
- Includes buzzer, LEDs, programmed IC (PIC) and all components
- Supply voltage: 3V DC

K 3167

\$14⁹⁵



NEW

Feb '99

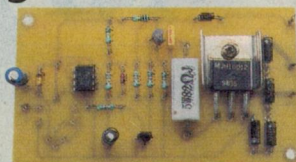
Engine immobiliser Mk II

- Circuit stalls engine when activated
- Connects directly to ignition system
- Kit can be assembled and used independently or can also be interfaced with K-4304 control module (keypad)
- Power supply: 12V DC
- Includes all components, case and PCB

K 4303

\$29⁹⁵

Dec '98



Immobiliser Mk II Keypad

- Interfaces with the new Immobiliser kit
- Choose your own 4 digit code for arming/disarming
- No hidden switches required or keys to carry
- Can be hidden or mounted for visible deterrence
- Power supply: 12V DC
- Supplied with hardware, keypad module, PCB and all components
- Specially designed quality metal case

K 4304

\$24⁹⁵

Actual product may differ from image shown

Jan '99



NEW

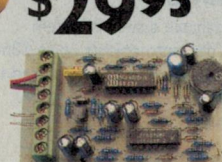
Screacher Car Alarm Mk II

- Utilises a high-output, compact piezo siren to blast an intruder inside your car
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K 4301

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Jan '99



NEW

Signal-triggered mains switch

- Turns on your entire home entertainment setup/hi-fi system with just one switch
- Activate any piece of gear that needs to be on when audio signals are present
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- Includes all components, hardware, PCB, case, pre-punched and screened front panel

K 5418

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Oct '98



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- Timer circuit that utilises the features of the Stamp microcontroller
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- Multiple inputs for design flexibility
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- Power supply: 12V DC
- K 1408

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Stamp microcontroller not included (uses K 1401 Basic Stamp)



Jan '99

NEW



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M205 250V 10A • High temperature 105°C black polyamide nylon 66 casing • 250VAC 10Amp rating • 200mm lead included • Fast connect. • Small, space saving line fuseholder. • Suits M205 fuses

P 9962

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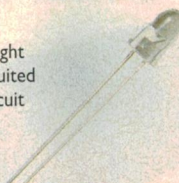


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Features extreme focal concentration of light with 5,000mcd light output and 8 degrees viewing angle, makes this product well-suited to "key-ring" torches, optical experiments using LDRs as a circuit isolator. Many more applications.

Z 4009

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Lightweight iron with non-burn silicon cable, holder sponge and tip. Variable temperature control from 200°C to 500°C.

T 2000

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T 4593

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Q 1490

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T 1396

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Q 1448

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This 1mW model uses a switchable dual-lens system to either project a small red dot onto objects up to 50m away (indoors), or to project a straight line that can be used to visually underline text or images that are out of reach. Operates on 2 x AAA batteries

T 2904

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Q 1429



BONUS \$79
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17 RANGE MULTIMETER
WORTH \$49.90 Q 1443



24 range 240V rated digital multimeter

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- Maximum hold and data hold
- Diode and continuity test
- Mains rated - safe for 240V mains measurements
- Protective rubber holster

Q 1563

SAVE \$20 \$99



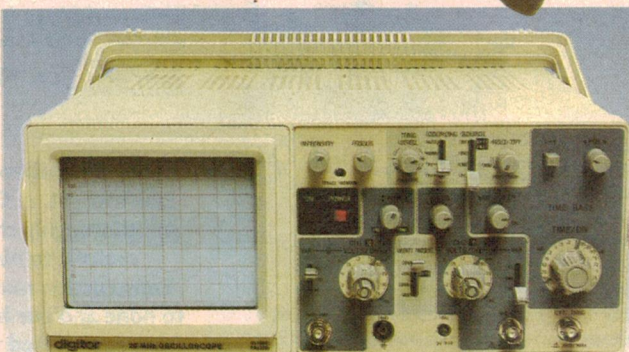
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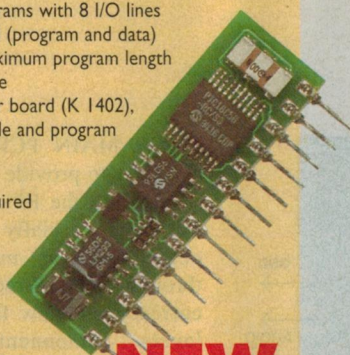
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K 1402

Parallel port interface for Stamp I \$1995

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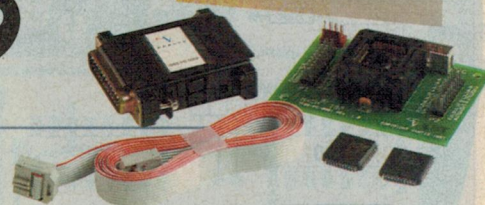
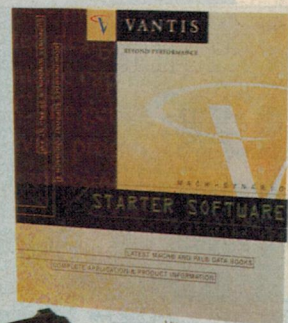
Vantis Mach 4 CPLD Starter Kit

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K 1450

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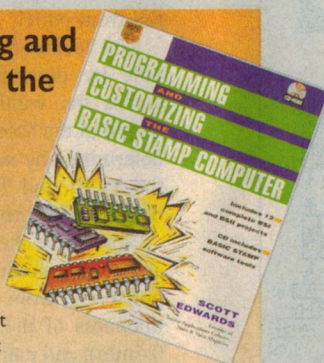
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	Carnegie	PowerHouse, 1048-1054 Dandenong Rd	9569 2644
	Greensborough	Shop 2, 16-22 Main St	9432 5125
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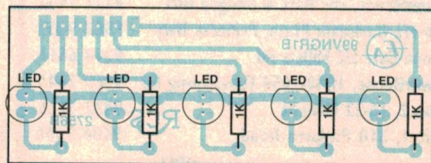
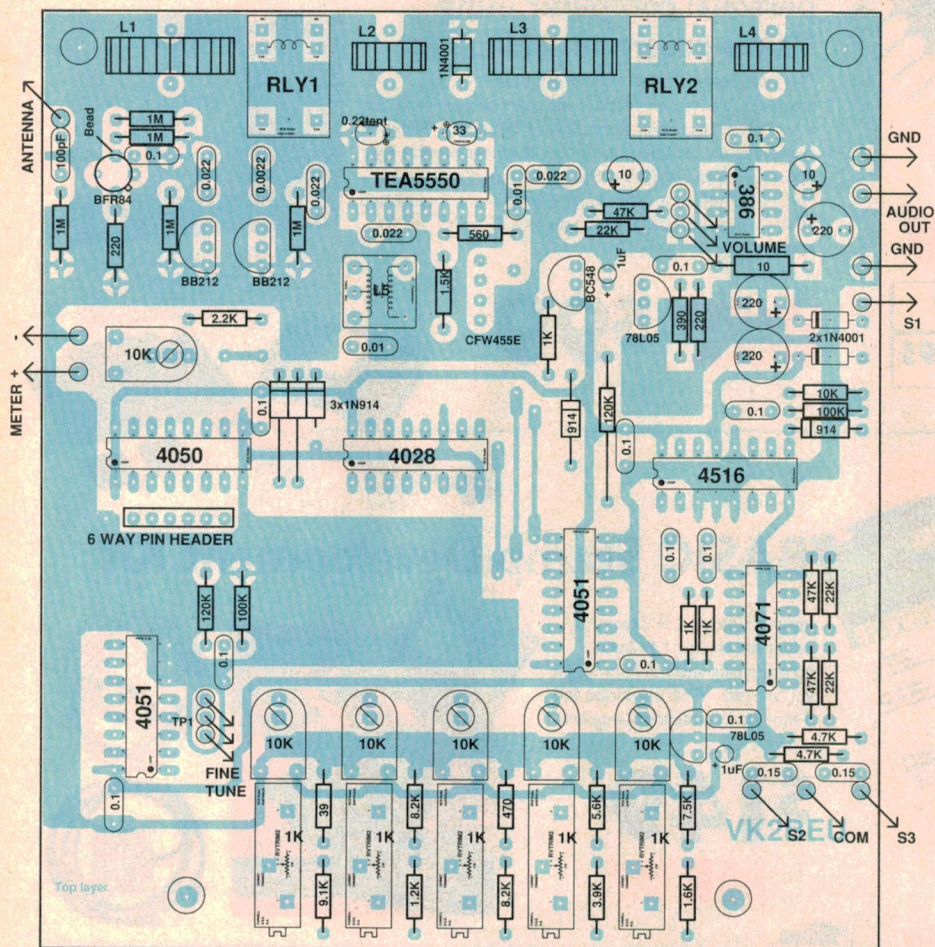


That's where you go!

Receiver for the VNG Clock - 2

Here's the second of our two articles describing VNG-5, a five-channel HF receiver designed to mate with the author's VNG Radio Clock featured in the March 1998 issue. Here he describes its construction, testing and alignment.

by Peter Stuart, B.E., VK2BEU



Here are the overlay diagrams for the small display PCB (above) and the main board (right), to guide you in placing all of the components and orientating them correctly. The main board is double sided to ensure RF stability.

THE MAIN PCB is double sided, in order to provide a copper ground plane beneath the RF components. The PCB has been specially designed with home construction in mind, and no plated-through holes are required. In places where current must flow from the top to bottom layers, component leads are usually employed. In eight other instances short lengths of wire are passed through the board and soldered to each side.

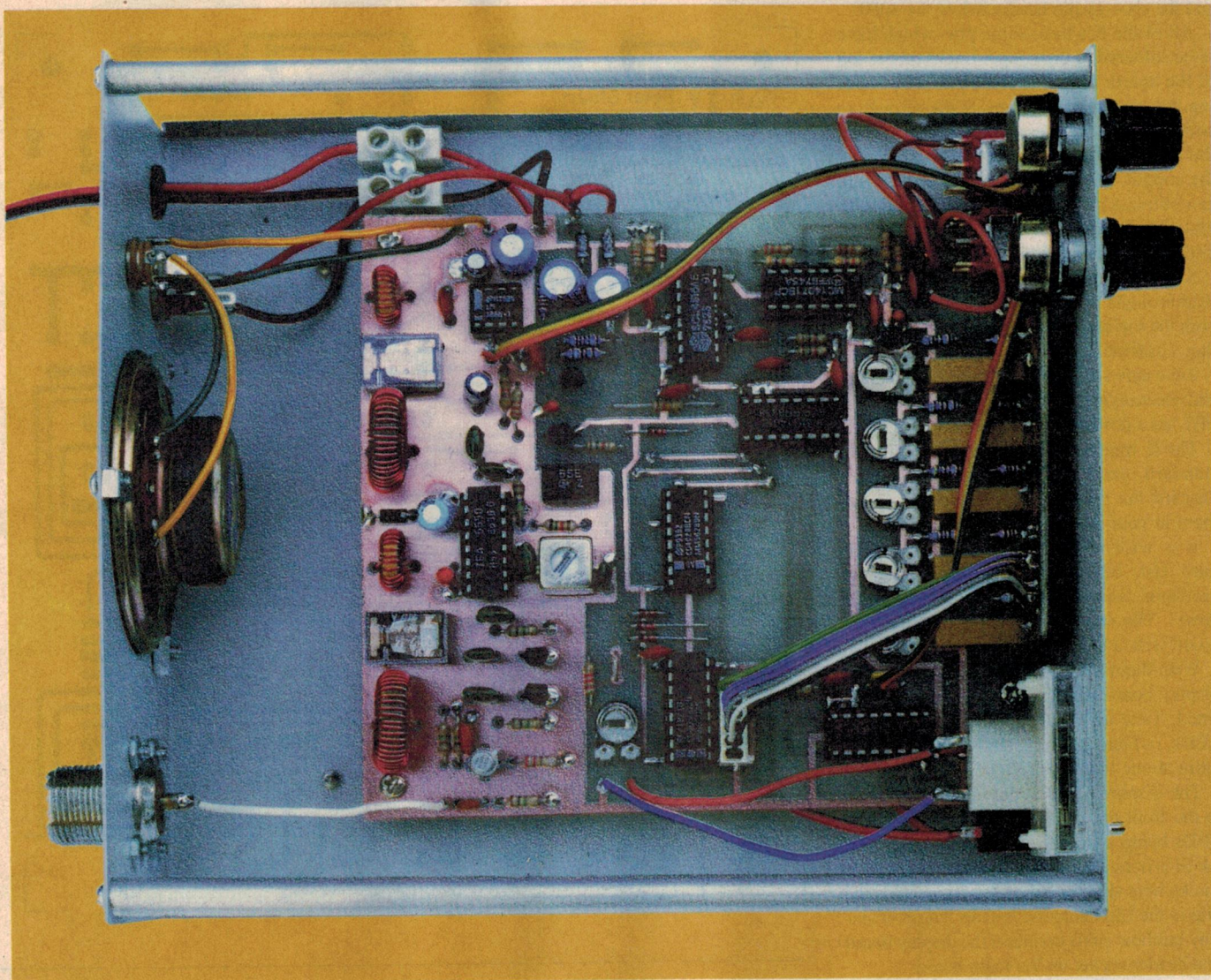
The receiver is mounted in a metal case, one size larger than the one used for the clock. The only critical part in the internal layout is positioning the PCB so that the 10-turn trim pots line up with the holes in the front panel.

The technique is to position the centre hole by drawing a vertical line halfway across the width of the front panel. The height of the hole up from the bottom edge is determined by soldering the 10-turn pots to the PCB, and fitting spacers beneath the board at the corners.

Now place the PCB on a flat surface and accurately measure the centre height of the pot screws from the flat surface. Add on the thickness of the bottom of the case (about 0.5mm), and mark this height as a line across the front panel. Mark out the holes for the other pots at 0.5" (12.7mm) centres either side of the centre hole. Double check your work, then drill the holes to take LED holders. I found 3mm LED holders to be a good size for the pot holes. Another five holes for the display LEDs themselves are placed 15mm above the pot holes.

Fit the LED holders into the drilled holes. Position the PCB inside the case with its front edge against the front panel and mark out the four corner holes in the bottom of the case.

Temporarily fit the PCB to the case and work out the position for the switches



Everything fits comfortably inside the case, as you can see.

(power toggle and pushbuttons). The pushbutton switches overlap the PCB and must be placed above it, so height is critical. Leave enough room above the switches for the pots.

If desired, the front corners of the PCB can be cut off to make room for the switches. There are no components mounted in the corners and the spacer screws are set in from the sides.

Make sure you choose good quality pushbutton switches, with a distinct 'click' action (e.g., C&K). Cheaper switches with wiping contacts will cause skipping past frequencies when stepping up and down.

The remaining holes for the switches, pots and meter can now be drilled and cut, together with the holes in the rear panel.

As with the VNG Clock, I reinforced the front and rear panels with 6mm aluminium

rods spanning from front to rear. 3mm screws pass through the panels and screw into tapped holes in the ends of the rods. Countersunk screws are used through the front panel.

The label was made the same way as the clock label. Prepare the artwork on your

Table 1: Coil Winding Details

L1	51 turns on T68 toroid (approx 1100mm wire)
L2	20 turns on T37 toroid (approx 350mm wire)
L3	46 turns on T68 toroid (approx 1000mm wire)
L4	19 turns on T37 toroid (approx 350mm wire)

Note: 0.5mm diameter wire is used on all coils.

computer's word processor (or a drawing package like CorelDraw). Then print it, and cover it with clear contact sheet. Apply double sided sticky tape to the back, and stick the label to the front panel. Trim around the holes and edges with a knife.

Coil winding

The coils are wound using the information in the table. Start with the two larger coils, L1 and L3. All windings should start and finish on the outside of the toroid, with the free ends of the wire pointing away from each other.

L3 is close wound so that 46 turns just fit around the inside of the toroid. L1 is similarly wound, but the last five turns are wound on top of the first layer.

L2 and L4 have their wire turns evenly spaced around the toroid.

Mark L1 and L2 with a dab of liquid paper, or similar, for identification. It is easy to get the coils mixed up, otherwise.

Now you can assemble the PCB. Start with the eight through-hole wire links. Six of these are to the right of the 4028 IC, and two are to the right of the meter trimpot.

Next fit and solder the 16 PCB terminal pins

and the six-way pin header below the 4050.

All of the ICs have some pins which have to be soldered to the copper tracks on the top of the board. This is accomplished by bending the corresponding pins of the respective sockets at right angles so they stick out from the sides. Since the pins now lay flat against the copper, they can be soldered to it. If you can obtain a commercially made board with plated-through holes, bending the pins will not be necessary. Do not fit the IC's yet.

Some of the other components act as leadthroughs and these must be soldered to both the top and bottom copper tracks, where they coincide.

Take care with the polarisation of tantalum and electrolytic capacitors, and note that the FET has a ferrite bead slipped over its G2 lead.

The IF transformer is the white coil from a standard pack of four AM radio coils. Discard the other coils in the pack, or put them in your junk box for the future.

It is wise to leave mounting the toroids until last, because their height can cause problems when you have the board upside down. The toroids can be secured to the board with a blob of silicone sealant.

With the main board assembled, the small display board can now have its components fitted. Take care with the orientation of the LEDs, which should stand approximately 3mm above the board.

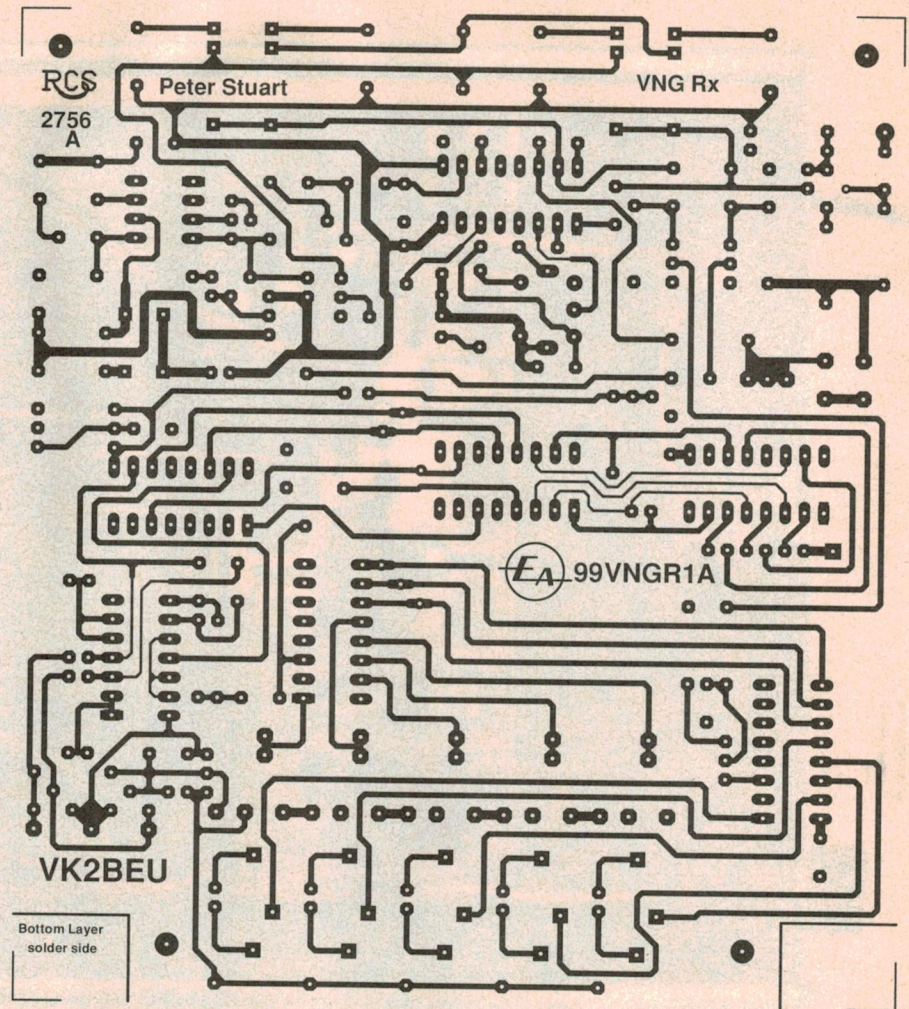
The display board is not actually fastened to the front panel. Its mounting relies on the LEDs being a tight fit in the LED holders. If the fit is not tight enough, several of the LEDs can be bent slightly out of line to increase the grip in the LED holders. A short length of six-way rainbow cable connects the display board to a header socket on the main board.

Carefully check your soldering on both sides of the board, then mount it in the case. Fit and wire the panel-mounted components to the PCB. The speaker is held against the rear panel by two cleats, cut and filed from a small piece of scrap aluminium bar. The panel meter is held in place with double sided tape.

Testing time

Check your interconnecting wiring. With the IC's removed, apply power. Check the voltages at the various IC power pins, remembering that there are several different supply voltages present on the board. The regulated supply to the TEA5550 should be within the range 8.4 to 8.6 volts on pins 8 and 9.

If all is well insert the ICs, being careful with orientation. Apply 12V DC power and the speaker should burst forth with noise which the volume pot will control. The tuning buttons should increment and decrement the illuminated LEDs. The relays will energise on the highest three frequencies. Do not expect to tune in any-



thing useful at this stage.

Alignment

Frequency alignment is best carried out with the aid of a modern communications receiver, of the PLL type with digital display. This is used to monitor the local oscillator frequency. If you don't have access to one, I will give you an alternate procedure later in the article.

The local oscillator frequency is higher than the tuned frequency by the intermediate frequency (455kHz), in all cases. This means that the oscillator should be adjusted to the following frequencies (in kilohertz): 2955, 5455, 9093, 13439 and 16455.

Lay a short length of antenna wire across the board and connect it to the communications receiver. Set the comms receiver to the first frequency listed above, and VNG-5 to its lowest frequency.

Allow three minutes for warmup, and set the Fine Tune control to its mid position. Then adjust the leftmost 10-turn trim-

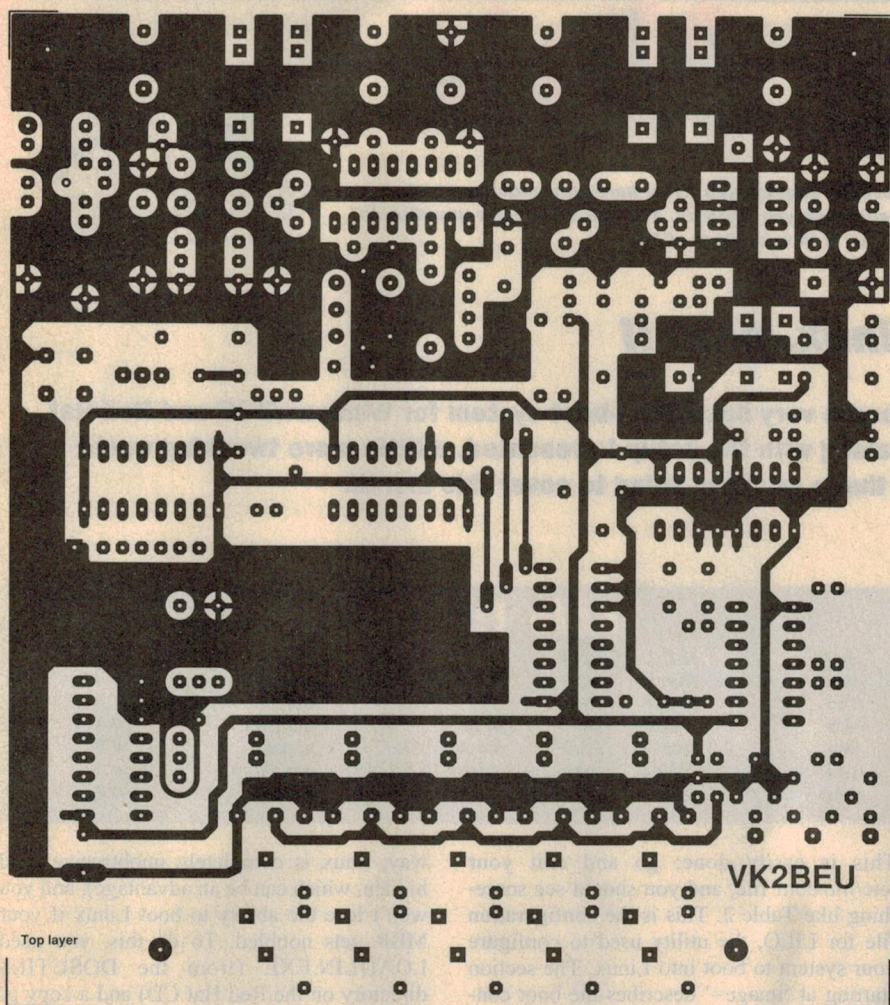
pot until a signal is observed on the comms receiver. Peak the signal to maximum amplitude.

Continue with the next 10-turn trimpot, after incrementing to the next frequency. Each trimpot should end up in the middle of its range. Reference voltages are given on the circuit diagram, as a guide.

With the local oscillator frequencies set, connect an antenna to the receiver. Now tune in the RF stage for each frequency using the 10k horizontal trimpots behind the 10-turn pots. The IF transformer can also be tweaked for a maximum at this stage, using any of the channels.

If you can hear VNG on the comms receiver, you should be able to tune it on your VNG-5. If not, you will have to wait until another time of day (or night), when propagation conditions allow reception in your part of the world.

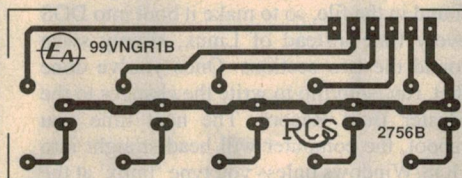
If you don't have access to a modern communications receiver, set the RF trimpots as shown in the photograph. Now slowly wind



Top layer

VK2BEU

Here are the patterns for both sides of the main board (above left, above) and the display board (right), all actual size for those who make their own. Boards are available from RCS Radio, however.



each of the 10-turn pots from one end of its travel until the familiar beep-beep of VNG is heard. This method will require some patience, since you won't know whether VNG's signal is reaching you on each frequency.

In general, you should use the longest, highest wire antenna you can erect. To minimise RF pickup from household appliances, run the signal from the antenna to VNG-5 through 50 or 75 ohm coax. However, for portable use, an antenna as short as six metres can be successful.

It is advisable to disconnect the antenna when not using the receiver, to guard against damage to the FET caused by lightning strikes. I lost a BFR84 during a

thunderstorm...

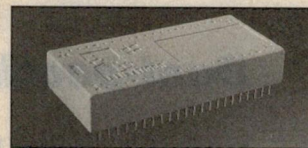
Finally, a word to those who might wish to combine the clock and the receiver into one large case. This has not been tried, and my thoughts are that it would be asking for trouble because of RF emissions from the microcontroller getting into the receiver circuitry. This is the main reason I kept the two units in separate metal cases.

The only sure way to make it work would be to completely shield the clock circuit in a metal box, inside the case. This arrangement would make access to the DIP switches difficult if they are to be changed frequently (e.g., when Daylight Saving Time changes).

However, I am sure there are those who will accept the challenge and have a go. ♦

THE TIGER COMES TO AUSTRALIA

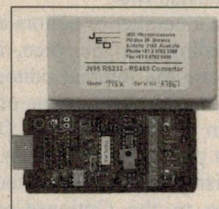
You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED.



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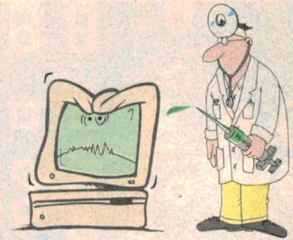
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Dual-booting Linux, part II

In my last column, I described a very basic dual-boot system for Windows/DOS and Red Hat Linux. While you could get along with the setup I presented, a little more tweaking would make life a lot easier, and that's what I'm going to cover this month.

If your other operating system is Win95, you may have noticed that Linux doesn't seem to recognize the long filenames on your Win95 drive (which should be the `/c` directory in Linux). To fix this, you have to edit the `/etc/fstab` file.

There are a number of editors available in linux, including `jed`, `joe`, `pico`, and `vim`. I personally use the internal editor built into Midnight Commander, a clone of the excellent Norton Commander for DOS. Type '`mc`' at the prompt to start it up. For some reason, it isn't enabled by default, so you have to go to the Options/Configuration menu to turn it on. Next best in the lineup is `pico`, followed by `joe`. If you haven't got either of these, reboot the Red Hat CD and select 'Upgrade' to install them. Trust me, you don't want to have to use the others.

The `fstab` file (short for FileSystem TABLE) is a list of all the drives available on your machine, their mountpoint (position in the directory tree) and the filesystems they use. Table 1 shows the `fstab` file for the setup you'll have. As you can see, `/dev/hda1`, your DOS drive, is mounted with the old MS-DOS filesystem, which only supports DOS 8.3 character filenames.

To make Linux use Win95's VFAT filesystem instead, simply replace the word '`msdos`' with '`vfat`', save the file and type '`shutdown -r now`' to reboot. (This is the approved method of rebooting a Linux box; a bit like the Shut Down menu in Win95. If you just reset the computer, it will take ages to reboot as it will do a full scandisk-like check of all the drives on the system.) When your system comes back up, type `ls /c` to see your long filenames in all their glory.

Default to DOS

Another thing that might be nice would be the ability to have your machine boot DOS/Windows by default, instead of Linux.

Table 1: `/etc/fstab`

<code>/dev</code>	<code>/hdb1</code>	<code>/ext2</code>		<code>defaults</code>	<code>1 1</code>
<code>/dev</code>	<code>/hda1</code>	<code>/c</code>	<code>msdos</code>	<code>defaults</code>	<code>0 0</code>
<code>/dev</code>	<code>/hdb3</code>	<code>/usr</code>	<code>ext2</code>	<code>defaults</code>	<code>1 2</code>
<code>/dev</code>	<code>/hdb2</code>	<code>swap</code>	<code>swap</code>	<code>defaults</code>	<code>0 0</code>
<code>/dev</code>	<code>/fd0</code>	<code>/mnt</code>	<code>/floppy</code>	<code>ext2</code>	<code>0 0</code>
<code>/dev</code>	<code>/cdrom</code>	<code>/mnt</code>	<code>/cdrom</code>	<code>iso9660</code>	<code>0 0</code>
<code>none</code>	<code>/proc</code>	<code>proc</code>		<code>noauto,ro</code>	<code>0 0</code>
				<code>defaults</code>	<code>0 0</code>

This is easily done; go and edit your `/etc/lilo.conf` file, and you should see something like Table 2. This is the configuration file for LILO, the utility used to configure your system to boot into Linux. The section starting at '`image=`' describes the boot configuration for Linux, and the section starting at '`other=`' describes the one for DOS. The system defaults to the first configuration found in the file, so to make it boot into DOS every time instead of Linux, simply swap round the two sections. Once you've done that, run `/sbin/lilo` to write the changes to the Master Boot Record. The next time you reboot, the computer will head straight into DOS/Windows unless you type '`linux`' at the LILO Boot: prompt.

One more option is to stop fiddling about with the Master Boot Record altogether, and boot into Linux from the DOS prompt. This

way, linux is completely unobtrusive (and hidden, which can be an advantage), and you won't lose the ability to boot Linux if your MBR gets nubbled. To do this, you need `LOADLIN.EXE` (from the `DOSUTILS` directory on the Red Hat CD) and a copy of your Linux kernel on `C:\`.

Boot to Linux, and copy the file '`/boot/vmlinuz`' over to `/c`. Then reboot to DOS/Win95, and copy `LOADLIN.EXE` from the Red Hat CD over as well. Create a file called `C:\Linux.BAT`, edit it and insert the line '`C:\LOADLIN C:\VMLINUZ boot=/dev/hdb1 ro`', assuming that your Linux boot partition is `hdb1`. Of course you can put `vmlinuz`, `LOADLIN.EXE` and `LINUX.BAT` in their own directory, just remember to change the paths in the batch file accordingly.

Now drop to DOS (if you're in Win95) and run `LINUX.BAT`. With any luck, Linux should boot up. Once this works, you can go back to DOS and type `FDISK /MBR` to clean LILO out of the Master Boot Record. From now on, all you need to do to boot Linux is to type `LINUX` at the DOS prompt. Note that you can't run `LINUX.BAT` from inside Win95, you need to drop to DOS first, or set it to run in MS-DOS mode. To do this, right-click it, go to Properties/Program/Advanced, and select the MS-DOS Mode checkbox. That way, Win95 will shut itself down before running the program.

That's about it, so good luck and until next month, Happy Hacking! ♦

Table 2: `/etc/lilo.conf`

```
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
prompt
timeout=50
image=/boot/vmlinuz-2.0.31
    label=linux
    root=/dev/hdb1
    initrd=/boot/initrd-2.0.31.img
    read-only
other=/dev/hda1
    label=dos
    table=/dev/hda
```


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Flying Toys for Bigger Boys...

HOW MANY of you have one of those big home theatre systems? I don't know about Oz, but they are big stuff over here in the USA. You know the ones — a big 36 or 48 or 60-inch television, a Prologic receiver, surround sound, speakers in front of you and behind you and a sub-woofer to rattle your guts during every noisy car chase.

A few days ago I paid a visit to a big electronics retailer near Seattle, part of a chain called 'The Good Guys'. I've dealt with them in the past, got two computers there, a telephone and an answering machine. This time around I was after some obscure lithium batteries for a couple of SRAM memory cards I use in my computers.

The Good Guys were having a sale, and Tom started drooling. Wouldn't it be nice to have a DVD player — make all the latest movies look reeeeeeal good! But to do that I'd really need a new television, to replace my little 12" portable. And to hear the sound properly, a surround-sound system, and maybe a special room to put it all in...

No, forget that. How about, instead, a little Walkman thing that records and plays digital Mini Discs. But what would I do with that? I don't have anything to record. My only CD player is one of those off-brand portable things, not what you'd consider truly hifi quality. And to play back the Mini Discs, we're looking at a new stereo system again. Forget that too!

Why is my hand always scratching at my Visa card when I go into these places? I don't really need that stuff. The only thing wrong with my present television is the programs that come out of it. I use it less and less as time goes on. Yet I lust after one of those big 36" tellies, and when HDTV digital comes in (already under test in our area) it will be hard to control myself.

As for the little Mini Disc recorder, well, it's just a cool thing to have. Even if I don't need it. Like the home theatre; a cool thing to have. I'm beginning to understand now...

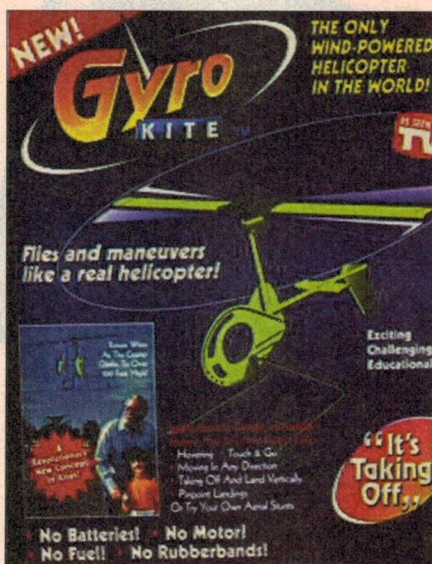
The big hyped toy for Christmas this year is a little electronic animal thing called a Furby. All it seems to do, at least in the TV commercials, is babble at you and roll its eyes. It can also babble back and forth with another Furby in the 'furbish' language, over

an infrared link. So, kids, to be totally cool, you can't have just one Furby, you must have a pair of them. Be sure to remind your parents of this.

Cool stuff. Toys are cool stuff. Cool stuff are toys. The home theatre and the Mini Disc recorder are cool stuff. Therefore, they must be toys. Voila! Toys for big boys. And girls, and whole families. But for me, a home theatre is out of the question because I don't have a home — only a small apartment.

I bought a what?

Instead, I bought a helicopter. Woah! you say... OK, you can pick yourselves up off the floor. A *real* helicopter wouldn't fit in my house either, so I got a baby one. A small toy, surrounded by never-ending controversy, even building to occasional flame-wars on the Internet.



It's called a Gyro-Kite, and it's basically a tethered autogyro. Common knowledge in Internet newsgroups is that the Gyro-Kite won't fly. For instance:

I've heard a lot of complaints from people that they couldn't get the thing to fly. I believe it takes a lot of wind (>10 MPH). There must be secret to the Gyro-Kite. I never built up the courage to buy one.

And...

The Gyrokite is very difficult to fly. It

requires a strong wind and careful handling. Many experienced fliers have been unable to get it to fly at all.

But wait! There's more!

Before anyone says anything positive concerning the Gyro they should try it. I said try, not buy. I'm surprised Corey would take an ad for this item, which is questionable in both flight characteristics and marketing methods. The appearance of this thread from out of the blue seems to be one aspect of the attempt to move this item to an unsuspecting public.

Still more!

As I understand it, this 'gyrokite' is basically a gyrocopter kite? That is, a non-powered rotating propeller that generates lift? I am quite curious how this design could be so poorly executed.

And finally, this two-way exchange...

Visit our web site at: <http://www.impress-group.co.uk/special.htm>

(Don't bother)

and see more about the amazing helicopter kite that will give a new purpose in life!

(No it won't its crap.)

Fun for adults and kids alike!

(No it's not?)

Spoil yourself!

(Spend your money on something else)

Well! After all those glowing recommendations, I just had to have a GyroKite. I ordered one off the Internet, for \$20 including shipping. Even if it wouldn't fly, it was worth twenty bucks to me to find out why not. So what started off as an interesting toy developed into an obsessive challenge.

What I discovered was that this 'toy' was in fact quite a sophisticated aircraft known as an autogyro. These things have been around since at least the Second World War, in much larger form, carrying cameras and sometimes people. Nowadays it's possible to buy a full-sized autogyro as a kit with a lawn-chair thing for a pilot to sit on, and a Volkswagen engine driving a propeller to push it along. Years ago I almost built one, going as far as ordering the plans to study them before going ahead with the kit. Instead I migrated to Australia, sold the plans, and that was the end of that.

An autogyro, be it a toy one or a big one,

has a rotor at the top, just like a helicopter. But a helicopter has an engine driving the main rotor, while the autogyro's rotor is driven by the force of the wind.

Since the helicopter's rotor is forced around by engine power, there is an opposite force, torque, trying to spin the helicopter's body around in relation to the main rotor. So a second propeller, called the tail rotor, is needed to counteract the tendency to spin. In the case of an autogyro, there is no force aboard the aircraft spinning the main rotor; that force comes from air flowing from the front of the aircraft. So there is no need to counteract torque, and thus no need to have a tail rotor. It's a more simple and elegant system all around.

The helicopter stays in the air by sucking air downward through the main rotor, with power from its engine. If the main rotor is tilted slightly forward, the direction of force is no longer vertical so the helicopter tends to 'slide off the top'. But because of the continuing lifting force, the net result is that the helicopter moves forward at a constant altitude. That is, if the pilot is doing things correctly. The helicopter is in a constant state of instability, and if the pilot loses concentration, oops!

In the autogyro, the main rotor is tilted slightly backward, and air flows UP through it instead of DOWN as in the helicopter. So the air CAUSES the rotor to spin, instead of impeding it.

If you take into account all forces at once — lift, wind speed, aircraft weight, drag — and work them out in a vector diagram, there is a force within a helicopter that RESISTS its progress through the air, making the engine work harder than would seem necessary.

In the autogyro the lift component is generated differently, resulting in a force that AIDS its progress through the air, making propulsion easier than would be expected. The spinning rotor blades can be seen as a solid sail, and the effect of the wind striking the surface obliquely produces much more force than the wind speed would suggest, just like in a yacht. It's said that a well-designed autogyro can produce useful power 15 times as strong as the wind itself.

Forward propulsion for the autogyro can come about in two ways. You can have a motor driven propeller, usually facing backward, to make the aircraft move along through the air. Or you can wait until the air is moving by itself (called WIND) and then hold the aircraft so it cannot move

backwards — and the wind has to move backward past the aircraft. Here we have a tethered autogyro, my little GyroKite toy, held in place by a kite string. In either case, wind past the rotor produces lift, and the autogyro flies!

There is one complication here, for both helicopters and autogyros: when the aircraft is moving forward, and the rotor is spinning, the side of the rotor moving forward is moving faster relative to the wind, and the side moving backward is moving slower relative to the wind. The result is that one side of the rotor has more lift than the other, and the aircraft tends to roll over.

This is corrected by placing a hinge in the centre of the rotor such that it can teeter up

"Ah, that thing will never fly", they say, eyeing the GyroKite. But so far I've had it up on 100 metres of string, scaring seagulls with its whirring noises.

and down. Since the forward moving blade has more lift, it moves up slightly, forcing the backward moving blade to move down by the same amount. So the whole blade is flapping, like a bird's wings, adding to or subtracting from the wind effect to equalize the lift. This contraption is called a flapping or teeter hinge, and it's present on helicopters such as the Bell Jet Ranger and the small Robinson machines used for cattle mustering. It's also present on the GyroKite.

If you wheel out your autogyro and face it into the wind, nothing is going to happen because the rotor blade is just that — a blade. For it to become a sail it has to be spinning, and air flowing obliquely under it will never cause that to begin. So, the pilot has to grab the stationary blade and give it a flick with his hand. With the help of the wind, or rolling down the runway, it will slowly gain speed, and eventually the blade will become a sail. At this stage, AUTOROTATION has been achieved, and the aircraft will fly.

It seems that failure to achieve autorotation is what shot down the doubting Thomases quoted above. Actually, it was a case of If All Else Fails, Read The Instructions. They clearly state that you must hold the autogyro into the wind, and GIVE THE ROTOR A SHARP SPIN.

I've found that a beach is the ideal place to fly the autogyro, when there's a nice steady

sea breeze. I hold the aircraft vertically by its nose, wind flowing toward its underside, and then give the rotor a twist. With the rotor spinning I begin to feed out some string so the gyro is dangling on about a metre of line. Then the fun starts.

As the rotor picks up speed it seems to move through some resonances, and it quivers and vibrates as the flapping hinge tries to get its act together. If you're holding the fuselage while it's vibrating, this stage never passes. The aircraft must be allowed to 'shake off its troubles' at the end of the string. Occasionally this fails, and the helicopter ends up spinning longitudinally on its string (gyroscopic translation of forces), to the embarrassment of the pilot.

When all is well — suddenly, and I mean suddenly, everything stabilizes. The vibration stops, the flapping sound of the rotor blade changes into a steady whir, and the aircraft begins to rise to the horizontal, and then higher. You can feel it, it's ready to go. Let out some more string, and it's away, to the oohs and aahs of assembled spectators.

Those most surprised to see the GyroKite fly are other kite people, and there are plenty of them, mostly elderly men who come to the beach every week with their wonderful masterpiece kites. "Ah, that thing will never fly", they say, eyeing the GyroKite. But so far I've had it up on 100 metres of string, scaring seagulls with its whirring noises.

Some of those big kites pull well over a kilogram on the string; the kite guys have fish-weighing scales to measure the pull. But as mentioned above, the autogyro produces some forward moment of its own, counteracting the resistance of the air, so its pull is light as a feather. You can comfortably hold the string between two fingers instead of tying it to a car door as the kite fliers do. The gyro sits up there on the end of its string, gently dipping and weaving with the changes of the breeze. Ahhhhh...

OK, so this isn't electronics. But it's fun. I know electronics people often branch in other directions such as photography or music, because it's interesting. This time we've gone into aviation, and aerodynamics.

As for me, the more I found out, the more I wanted to know, and I ended up spending many fascinating hours on the Internet. That's where I learned all the stuff about autorotation and vector diagrams and flapping hinges. Just search on the word 'helicopter' and you'll see for yourself! ♦

Index for Volume 60

January 1998 to December 1998

Automotive Electronics

The Electrajat PC EFI diagnostic system	Jan p28
Troubleshooting on a Mitsubishi Magna TR	May p24
Reading ECM diagnostic codes	Aug p22

Book Reviews

Windows NT4 reference	Mar p43
Electronics Servicing	Mar p43
Upgrading & Repairing PCs	Apr p68
Beginning Electronics Through Projects	Apr p68
Cellular Radio Principles	Apr p68
Electronics Engineer's Handbook	May p39
Practical Radio Frequency Handbook	May p39
Electrical Principles	May p39
Troubleshooting & Repairing PC Drives & Memory Systems	Jun p37
Battery Reference Book	Jun p37
Digital Filter Designer's Handbook	Jun p37
How Computers Work	Jul p51
Telephone Installation Handbook	Jul p51
Essential Analog Electronics	Jul p51
Simplified Design of Data Converters	Aug p16
Teach Yourself Electricity and Electronics	Aug p16
Cosmic Bullets	Sep p33
Tab Encyclopedia for Technicians and Hobbyists	Sep p33
Illustrated Dictionary of Electronics	Oct p37
Domestic Security Systems	Oct p37
Antenna Design: A Practical Guide	Nov p71
TV Across Australia	Nov p71
Programming and Customising the Basic Stamp Computer	Dec p73
The Consumer's Guide To Wireless Security	Dec p73

Circuit & Design Ideas

Electric fence tester	Jan p40
Resonance meter & cap tester	Jan p40
Aid for soldering SMD components	Jan p40
PC control for stepper motor	Jan p40
RC fail-safe with voltage guard	Feb p40
Simple electronic key with time delay	Feb p40
Add-on for the Frequency Shifter project	Feb p40
Engine immobiliser with alarm	Mar p36
Simple counting metronome with accented beat	Mar p36
Four by four-second voice recorder	Mar p36
Mercury tilt switch alarm	Apr p40
Hardware screen saver	Apr p40
Fuel pump safety cut-out	Apr p40
Micropower single gate LED-Flasher	Apr p40
ESR meter measures batteries, too	May p40
Low power bargraph voltmeter for cars	May p40
40109 based Schmitt trigger	May p40
Simple V-ref for Pocket Sampler	May p40
DIY keypad for microprocessors	Jun p38
LCD DPM input isolation circuit	Jun p38

3V xenon strobe	Jun p38
Driveway detector using pneumatics	Jun p38
Automotive timing light	Jul p40
Plant monitor	Jul p40
IR intruder alarm	Jul p40
AM re-transmitter	Jul p40
Simple inductance measurement using a CRO	Aug p40
Longer life for the ESR Meter	Aug p40
Photographic timer	Aug p40
Linking smoke alarms	Aug p40
Novel running light display	Sep p42
Universal IR Controller for a PC	Sep p42
Low current bar-graph display	Sep p42
Simple mod improves Cable Break Finder	Sep p42
UPS for cordless phones	Oct p42
Solar Regulator mods	Oct p42
Rotor display for model train controller	Oct p42
Whistler receiver for Earth's natural radio	Oct p42
Loss of power indicator	Nov p34
Wireless TV test pattern	Nov p34
Curve Tracer adapter for DSOA	Nov p34
Thermocouple thermostat	Nov p34
Bore pump timer	Dec p40
Trailer tail light supply	Dec p40
VHF preamplifier	Dec p40
Simplest surround sound system	Dec p40

Construction Projects

'Four in One' Mini Bench Supply	Jan p46
Flexible Counter Module	Jan p52
A Splitter for VGA/SVGA Video	Jan p60
Cable Break Finder	Feb p42
Direct Injection Preamp Using J-FET	Feb p52
Line Carrier Link for home automation -3	Feb p56
A self-setting VNG 'Radio Clock'	Mar p38
Line Carrier Link for home automation -4	Mar p44
The Caps Catcher	Mar p48
Video Fader & Wiper	Apr p46
'Tiny Tube' portable lights -1	Apr p54
The Super Ear	May p46
'Tiny Tube' portable lights -2	May p52
Improved VHF/UHF masthead preamp	Jun p40
48V phantom supply for mics and DI's	Jun p50
Motorcycle intercom	Jul p42
240V variable frequency drive	Jul p56
In-circuit LOPT/FBT tester	Aug p42
Low cost SMT mini light chaser	Aug p46
'Front End' for PC sound cards	Aug p56
'Front End' for PC audio recording	Sep p44
Intelligent baby alarm	Sep p56
PC-based DSO adaptor Mk3 -1	Oct p44
Signal-controlled mains power switch	Oct p58
Putting a CPLD to work -1	Nov p40
PC-based DSO adaptor Mk3 -2	Nov p46
Preamp for tape heads	Nov p56
Intelligent doorbell using a BASIC stamp	Dec p46
Tiny shielded resistance box	Dec p56

\$10 Wonders

Whimsical musical box	Feb p50
A digital probe	Mar p52
Sample & hold adaptor for multimeters	Apr p60
Bike & personal alarm	May p50
A capacitance gauge	Jun p66
A two-timer	Jul p46
A monitor for your mailbox	Aug p50
A 'designer' door alert	Sep p50
Precision temperature alarm	Oct p52
A mini roulette wheel	Nov p44
Sparkling christmas lights	Dec p58

Exp. with Electronics

Batteries and Chargers -2	Feb p63
Seven segment display circuits	Mar p63
Voltage converter circuits	Apr p27

Features & Reviews

Panasonic's NV-DS5 DV camcorder	Jan p14
Kit for valve audio enthusiasts	Jan p20
Bubble tank for PCB etching	Jan p55
Iroda SolderPro Soldering Iron	Jan p87
Voicesurf 56Kx voice modem	Jan p92
Managing the data from ESO's VLT	Jan p17
COMDEX'97 show report	Feb p12
Scanning the X-ray universe	Feb p18
A-V processor/mixer for video editing	Feb p21
Dural 40 Years On	Feb p24
Poptron video surveillance system	Feb p31
Fluke's New 79 III true-RMS DMM	Feb p27
EMC — The realities	Feb p86
UPN laser data transceiver	Feb p92
Upsonics MI-300B UPS	Feb p69
Canon's MV-1 digital camcorder	Mar p10
Using ultrasonics to make ferrofluids	Mar p18
NEAR: now it's going far...	Mar p20
JC25 two-way bookshelf speakers	Mar p24
Trench-gate MOSFETS set new standard	Mar p76
Cable tester from Altronics	Mar p84
Videotech's VMX400 video mixer & TBC	Apr p12
Icom's IC-PCR1000	Apr p22
The Philips DVD840 player	Apr p30
Cryptography: The Art & Politics -1	Apr p79
Capacitance & clamp meters from Jaycar	Apr p86
The Zipshot frame grabber	Apr p92
Research tool or death star?	May p14
NASA's last tour on troubled outpost	May p20
300W subwoofer amp kit from Jaycar	May p57
Neutrik A2 audio test set	May p80
Linux: what it's all about	May p90
Sony's new line of analog camcorders	Jun p14
Pioneer's 'Home Theatre In Box'	Jun p18
The Yin & Yang of China's Television	Jun p 20
MOMI, museum on the move	Jun p24
DSE kits for popular EA projects	Jun p70

Cryptography: The Art & Politics -2	Jun p90
Communications: the crucial link	Jul p14
The 'Empower Modulator'	Jul p18
Electronics courses: what's available	Jul p20
Assembling your own PC for \$100 -1	Jul p24
Designer's guide to Li-Ion batteries -1	Jul p84
Canon's MV100 digital camcorder	Aug p14
Kodak's DVC323 digital video camera	Aug p18
Assembling your own PC for \$100 -2	Aug p20
New generation color printing technology	Aug p88
The latest digital cameras	Sep p14
Olympus Camedia C-1400L	Sep p20
Moving people safely with electronics -1	Sep p24
Designer's guide to Li-Ion batteries -2	Sep p90
Digital cameras	Oct p14
Moving people safely with electronics -2	Nov p20
Clearance treasures from AllThings	Nov p26
The latest test & measuring instruments	Nov p86
Tektronix new handheld TX series DMMs	Nov p90
Electronics books go for lift-off	Dec p16
The experts in sound preservation	Dec p20
WINRADIO's WR-1500e comms receiver	Dec p24
Outstanding new 3-way speaker system	Dec p42
SILEX and optical satellite links	Dec p86
New satellite phones	Dec p88
IL-2000: real-world interfaces for your PC	Dec 92

Forum

Curing cancer with a 555 in a jiffy box!	Jan p24
More on electrotherapy devices	Feb p28
Revisiting topics we looked at last year	Mar p26
Those 'alternative electrotherapy' devices	Apr p24
More on Dr R. Beck's alternative devices	May p28
Dr Beck's 'Brain tuner'	Jun p28
More on TENS/TNS	Jul p28
Comments from other medicos	Aug p28
Atmospheric research is not new	Sep p30
Motorhome safety and EMC in Europe	Oct p30
Home's truths about G-code, DVD ...	Nov p22
More on those moot electrotherapy devices	Dec p28

Moffat's Madhouse

The incredible 56k modem debacle!	Jan p72
Designing the Perfect Computer	Feb p72
Doing DOS in Win95	Mar p56
Defusing Internet Exploder 4...	Apr p72
Wheeled music - of all sorts	May p70
Internet Exploder tamed at last	Jun p68
Another raising from the grave...	Jul p62
Good old 'Eff-Tee-Pee'	Aug p62
Grrrid-lock: can electronics help?	Sep p62
Windoze Mighty Hate!?	Oct p66
Sounds pretty good: big bands are back again	Nov p60
Love stories, and the Net...	Dec p70

Notes & Errata

Video Enhancer	Mar p69
Audio Masker	Mar p69
Laser-based data transceiver	Mar p69
Video & pulse distribution amp	Mar p69
Pocket Sampler	Mar p69
Line Carrier Link	Mar p69
Super Ear	Jul p89

IR remote volume controller	Jul p89
Pro Series 4 preamp	Jul p89
240V variable frequency drive	Sep p98
Motorcycle intercom	Sep p98
Capacitance gauge	Sep p98
Video Enhancer & Stabiliser	Oct p98
Universal IR controller	Nov p98
Video Enhancer & Stabiliser	Dec p35
Experimenting with electronics (Apr '98)	Dec p35

Spotlight on Software

Reference CD-ROM from Matrix	Jan p90
Microcode's Circuitmaker design suite	Mar p92
Red Hat Linux 5.0	May p92
New graphing software for the pocket sampler	Jun p92
Adaptec's Easy CD Creator Deluxe	Jul p92
Adobe Acrobat V3.0	Aug p92
Leprechaun's Macro Virus Buster	Sep p93
Digital Electronics CD-ROM from Matrix MM	Nov p92

The Challis Report

The NAD 515 CD player	Jan p10
Yamaha multimedia speakers for PCs	Feb p10
Pioneer PDR-04 audio CD recorder	Mar p10
Mitsubishi's LVP-X100A LCD video projector	Apr p10
Sony's FD Trinitron Wega flat-screen CTV	May p10
Yamaha's AV-1 compact home cinema system	Jun p10
Sony's DVP-S715 DVD/CD player	Jul p10
Pioneer's DV-505 DVD/CD player	Aug p10
Pioneer's PDP-V401E plasma flat screen	Sep p10
Advances in hearing protection technology	Oct p10
Apple Computer's Studio 15" LCD display	Nov p10
Marantz' CM635 CD/MD player	Dec p10

The Serviceman

Intermittent in my aircon system	Jan p36
The dodgy repair that really lasted	Feb p36
The set that could easily kill its owner	Mar p29
Why your VCR munches tapes!	Apr p36
An intermittent that took eight years to fix	May p36
Sophisticated gear with low-tech faults	Jun p34
PC system with a 'hardware virus'	Jul p34
My new breadmaker is faulty!	Aug p32
The amp that was nearly a boat anchor	Sep p34
Bugged by faults of the six-legged kind!	Oct p34
Poppie, could you fix this video, please!	Nov p30
What was at the end of red herrings?	Dec p32

Vintage Radio

Two postwar Kriesler mantel sets	Jan p68
The dodgy repair that lasted longer...	Feb p36
The Philips 1052 and 1044 mantel sets	Mar p66
Taming the Autodyne	Apr p14
Early test equipment - continued	May p58
Early car radios	Jun p61
Early two-valve sets 1922-1926	Jul p48
The year that was - 1926	Aug p70
Two valve sets	Sep p34
The year that was - 1927	Oct p68
Aerials, coils and how it all works	Nov p62
Mick Fitzpatrick and his wireless	Dec p62



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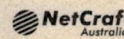
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Vintage Radio

The Ultra-audion and/or Marnikay Receiver

The very early single valve Ultra-audion is a such a seemingly simple set that it's a wonder it works at all. However finding out just how it *does* work was not an easy task...

THIS MONTH'S story has been prompted by my restoration of a 'Varcola' one-valve set, made long ago by the Adelaide firm Varcoe & Co, of 57 Gawler Place in Adelaide. Varcoe & Co seemed to be one of the plethora of dealers-cum-builders who appeared and disappeared again within a couple of years (if that) in the mid 1920s.

The little set appears in Fig.1. It probably started life as a crystal set, and where there may well have been the crystal, there is now a valve holder. Similarly there may have been a stud switch for the coil, where there is now a rheostat. Varcoe and Co advertised in *The South Australian Wireless and Radio Weekly* in July 1925 as building their own sets and 'rebuilding and upgrading' your existing set.

The little sloping-fronted cabinet is more akin to a crystal set than a valve set, and when found was in a fairly sorry state. Each of the thin oak panels had cracked and in some cases warped, and a great amount of care and know-how was required to reglue and straighten them. A close friend who is a dab hand at French Polish finished it off to a high standard.

The panel was very badly oxidised, but was professionally cleaned and re-whitened.

Inside, there was practically no 'guts'. There was a very shabby coil former with a very loose single winding. Inside the former was the 2-ohm filament rheostat, thereby indicating a 'bright emitter' valve. (It's the position of the rheostat, inside the coil former, which suggests that this may have been where the stud switch

was originally placed.) The tuning gang was missing, and the other wiring was so scant that it too was presumed to be incomplete.

However, upon tracing it out, the circuit appeared to be almost identical to that of the Ultra-audion (so-called) which appears in *Wireless Weekly* for December 30, 1927 — as reproduced in the booklet *The Best of Australia's Wireless Weekly in 1927*, produced a few years ago by EA.

The only difference to the Varcola and the WW circuit is that the grid leak is a fixed resistance, and in this case it appears to have been a home-made type: a

piece of thin card upon which is a simple line drawn with 'Indian Ink' and then connected across the grid capacitor. In the Varcola set only a fragment remained, and it has been replaced with an older style 2M Ω resistor.

By extreme good fortune, a tuning capacitor was unearthed in the spares department, complete with vernier, that bolted exactly into the existing mounting holes on the panel — and not only that, the dial matched exactly the large dial of the rheostat. There can be times when lady luck smiles!

Theory of operation

It's not easy to understand the theory of operation for this (ostensibly) simplest of valve receivers. Firstly, it's necessary to understand how an oscillator works, and trying to find out that in words of one syllable or less can be likened to standing up in a hammock!

The so-called 'standard texts' such as *Radiotron Designers' Handbook*, Terman's *Radio Engineering* and *The Radio Amateur's Handbook(s)* were all remarkably brief and superficial in their description of an oscillator. However, a somewhat obscure publication called *Practical Radio Communication* (Arthur R. Nilson and J.L. Horling; McGraw-Hill Book Company Inc, 1943) describes the action of an oscillator very succinctly, and the following description and diagrams are largely quoted therefrom.

Fundamental oscillator

Fig.2(a) shows the fundamental oscillator, and Fig.2(b) shows the curves illustrating the oscillator action. When switch S is closed, electrons are emitted and bombard the plate. This electron flow thus described will cause current flow in the plate circuit. At t₀, the moment of switch-on, there is no grid bias



Fig.1:
The little 'Varcola' set, which is really very simple and compact. It probably started life as a crystal set.

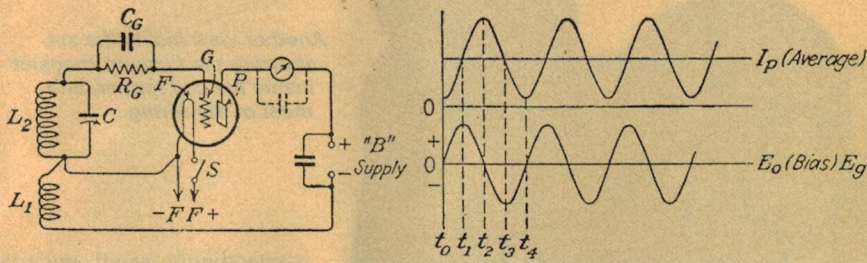


Fig.2: The basic valve oscillator circuit, with the respective phasing diagrams of grid voltage and plate current.

developed nor plate current flowing.

Beginning at t_0 , the current will flow through coil L_1 , resulting in a magnetic field around the coil. This magnetic field subsequently induces a voltage in L_2 . The phasing of the coils, and hence the polarity, is important, and must be positive at the grid to cause an increase in plate current.

The voltage on the grid is proportional to the rate of change of plate current. When the plate current has reached t_1 on the curves, its rate of change (the interval between t_1 and t_2) will decrease due to the characteristics of the valve. As can also be seen, as the rate of change of plate current decreases, so the rate of change of grid voltage decreases, causing the rate of change of plate current to decrease even more.

Some careful understanding is required. Even though the plate current is actually on the increase, the *rate of change* is decreasing. Hence at time t_2 on the curves, the plate current is at a maximum, its rate of change is zero, and the induced voltage on the grid is zero.

As the plate current starts to decrease, the rate of change is now negative. Thus a negative voltage is induced on the grid, and the plate current decreases even further. This action continues until t_4 on the curves, when the plate current is minimum and the grid voltage is zero.

One cycle of oscillation has now been completed, and the process continues as long as the voltages are applied. The important thing to remember about an oscillator, is that the grid is positive for half of the cycle, and therefore grid current flows.

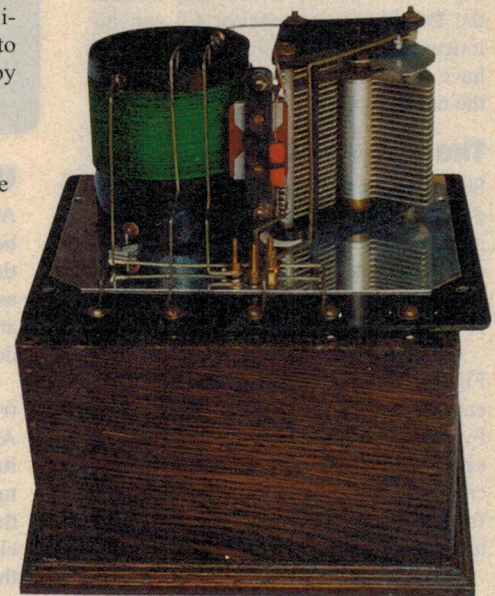
Another important concept about oscillators is that the valve itself does not oscillate. What it does is amplify the electrical impulses impressed on its grid from the oscillatory circuit, and delivers this amplified energy back to the output circuit to make up for the intrinsic losses and thereby maintain oscillations.

Colpitts oscillator

Fig.3 illustrates the basic Colpitts capacitive feedback oscillator. The grid excitation voltage appears across the capacitive reactance C_3 . The initial excitation is produced as before through the plate blocking capacitor C_2 in the form of electron displacement, which in turn causes electron displacement in the plate excitation capacitor C_1 . This produces a potential difference across C_1 and C_3 which excites the grid and produces sustained oscillations.

It may help the explanation if we remember that at the point of switch on, E_p charges C_1 and C_2 in series. These capacitors then commence their discharge at point X, through the coil to point Y which then charges C_3 . The discharge of C_3 then produces the small positive grid voltage corresponding to the period t_0 - t_1 of the previous diagram, and sets in motion the whole train of events to sustain oscillations.

In other words, the instantaneous voltages at the ends of the circuit are opposite in polarity with respect to the cathode, and are therefore in the right phase to sustain oscillations as described above.



Behind the front panel, there's very little apart from the coil and tuning capacitor.

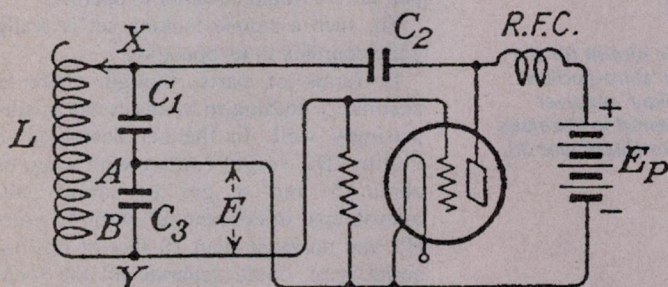
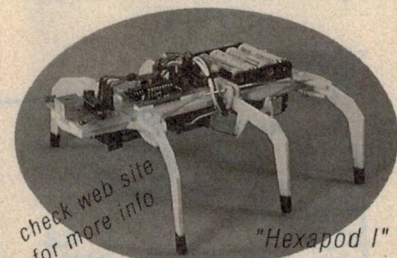


Fig.3: The classic Colpitts oscillator.

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The Ultra-audion

The ultra-audion is said to be the equivalent of the Colpitts, but with the voltage division for oscillation brought about by the grid-to-filament and plate-to-filament capacitances of the valve itself. In the circuit of Fig.3 (in which incidentally the grid capacitor C_g is not shown, since it is illustrated as an oscillator and not as a detector), C_1 is replaced by the plate-to-filament capacitance of the valve, and C_3 is replaced by the grid-to-filament capacitance. However, this implies that the DC blocking capacitor C_2 can no longer exist in the circuit. But does it have to be in the positive leg? Why not the negative leg?

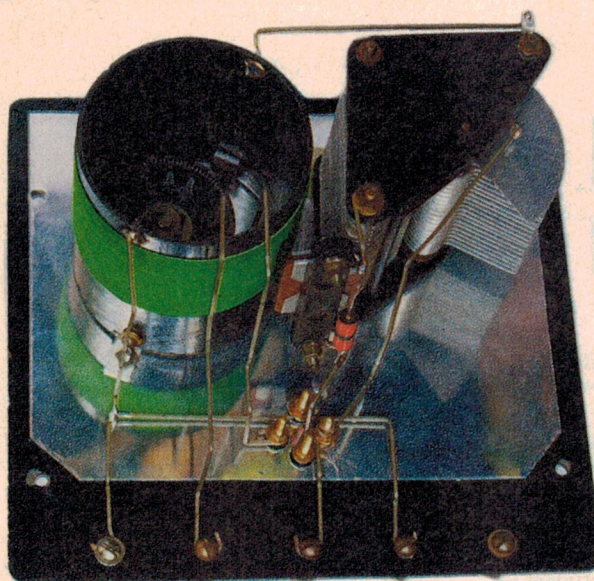
The WW circuit

So, is the circuit in Fig.4, the topic of our discussion, a true ultra-audion? Most likely it is not. The text for the article (30/12/27) claims that the circuit is better known as the 'Marnikay', and a closer examination again is warranted.

If it were a true ultra-audion, C_1 from Fig.3 is implied by the plate-to-filament capacitance, and in the case of the circuit in Fig.4, would be directly from aerial to earth. (So it would include the antenna capacitance.) The other capacitance, C_3 from Fig.3, is shunted across the 500pF tuning capacitor.

For the Colpitts/ultra-audion to function satisfactorily, conventional wisdom says that the ratio of C_3/C_1 is usually about 3 to 1. It's hard to see if this would apply here, since the plate-to-filament capacitance of the early triodes seldom exceeded about 5pF. Perhaps the antenna capacitance would make up the difference.

Another problem is that for oscillation C_3-C_1 must appear across the entire tuning coil, which again does not seem to be the case.



Another view inside the set, showing the filament rheostat inside the coil former, and most of the wiring.

Ultra-audion or Marnikay?

As there are sufficient discrepancies between the circuit of Fig.4 and the description of an ultra-audion, we are going to assume that this is not an ultra-audion at all, and refer to it as the Marnikay. So, just how does this little baby work?

The tuned circuit is a series tuned circuit (refer to my November 1998 column on Aerials, Coils and How it All Works). The full anode potential is applied through the tuning coil with obviously no DC loss. It then fully charges the tuning capacitor, and electrons freely pass from filament to plate thus causing plate current to flow. The tuning capacitor now discharges through R_1 .

At this stage, no current is being drawn, as there is no voltage drop across R_1 and the full DC appears at the grid. The grid will now immediately draw current because it is positive, and hence a voltage drop will appear across R_1 . In some circuits, R_1 is adjustable, and in others it is fixed. Nevertheless, a large enough voltage drop will appear across R_1 , and a cor-

respondingly small positive grid potential will cause grid current to flow for a fraction of the cycle.

This will now cause the decreasing rate of change in plate current as described earlier on. A point in the cycle will be reached where there is zero grid voltage, maximum plate current, and the whole cycle starts again.

So, why does not a permanent positive DC voltage appear at the grid, by virtue of the plate being directly connected (via the coil, which can be ignored) to the resistor R_1 ? The answer is that we have a resonant circuit, in which there is a voltage gain appearing across the tuning capacitor at the incoming frequency. This voltage is in the order of several hundred millivolts, and the resistor is adjusted to keep the grid just below the point of oscillation, like any other regenerative detector.

R_1 also serves as the grid leak, and functions not by being connected directly to the filament as in a conventional circuit, but via the phones and the internal resistances of the batteries and hence to earth. The unmarked grid capacitor is of course the grid capacitor, which in conjunction with R_1 forms a leaky grid detector.

The filament rheostat R_2 is there for adjusting the gain of the valve, and controls the electron stream from cathode to anode. In the little set which is the subject of this article, R_1 was a fixed resistance of 2M Ω and the entire gain, oscillation and ultimate selectivity was controlled via R_2 . As the valve was a bright emitter, anticipating the thermal inertia delay became a skill approaching a fine art! If R_1 were a 1M Ω pot, the set would be easier to operate.

So, such a simple looking set is really quite complex in its operation.

In terms of parts, though, there is absolutely nothing to it, and it works surprisingly well. In the set described, a Philips 'D2' bright emitter with a μ of about 5 and a gm of about 300 micromhos, in conjunction with 45 volts HT and no more than 10 feet of trailing aerial wire, could separate all the local Adelaide stations at comfortable phone strength. Not bad, eh? ♦

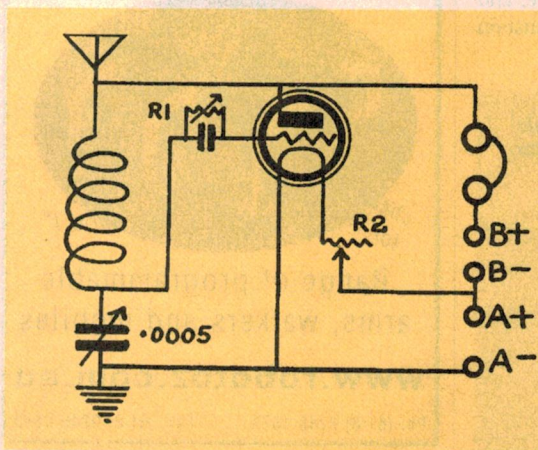


Fig.4: The circuit for the so-called 'Ultra-audion' or 'Marnikay' receiver that appeared in *Wireless Weekly* for December 30, 1927.



Information Centre

by Peter Phillips

Free energy, NiCad charging, other batteries & more

Our topics this month include free energy devices, the EA website, charging and deep cycling NiCads (with a complete circuit you can build), a discussion on charging deep cycle lead acid batteries and a project inquiry.

THE 20th CENTURY, from a technical point of view, has been quite a time. It's difficult to pick the most important event, or events, but surely Einstein's Theory of Relativity and quantum physics have an important place. The latter gave us the transistor, and also the realisation that Newton's laws do not always apply. As well, it has led to a growing realisation that we still have lots to discover.

This differs considerably from 100 years ago, when there was talk of closing patent offices. "There's nothing left to invent", they said. However, the *Titanic* disaster shook the world out of its complacency, and two world wars ensured increased technical development and continuing work for patent offices.

So what will the next century bring that will affect our lives to the extent we've seen this century? I suggest this will largely depend on whether we discover further sources of energy. To date man has discovered animal power, followed by wind power, steam, oil and nuclear power. The discovery of electricity has allowed us to use these raw energy sources more effectively and in more ways.

But imagine the situation when we find another energy source, particularly if it's abundant and doesn't affect the ozone layer. Human living standards must increase, just as it has with each new energy source discovered over the last several thousand years. What this energy source will be is anyone's guess, but perhaps there's a clue in the following letter, which asks about free energy devices. Not possible, you say? Well maybe not, but remember that quantum physics has rewritten all the rules, and thinking along traditional lines is no longer the only way to go.

Free energy?

Do you know anything about free energy devices? Ever since WWII, people have claimed to have invented free energy devices which produce more electrical power output than power input. However, in most cases the power produced is lost in the statistical noise. Most researchers are unknowns who tinker around in a garage, but there are also a few with impressive backing.

As physics progresses, this type of research is becoming more credible. The latest sub-atomic physics research indicates that space is not just 'space' but actually energy locked into spherical structures so small that trillions of them would fit into an electron, each one having the energy of a hydrogen bomb. ('Extracting Electrical Energy from the Vacuum by Cohesion of Charged Foliated Conductors', by Dr Robert L. Forward of Hughes Research Labs, Physical Review, vol 30B, pp 1700-1702.) The upshot being if we could release the 'space energy' inside an electric light bulb we could destroy the galaxy. Luckily this is apparently impossible.

Free energy electrical devices seem to exploit the principle that due to quantum variations, not all the energy is locked up. Instead a minute amount leaks out, which can be recovered using electrostatic or magnetic field reversal techniques.

There has been a considerable amount of research by a lot of people. For example, Robert Adams (former chairman of NZ Division, Institute of Electrical and Electronics Engineers) has produced a motor that provides more power out than power in. Also, Floyd Sweet, one-time electrical engineer for US General Electric, has developed what he calls a 'Vacuum Triode Amplifier'. Essentially the device amplifies an input signal with a gain of two million. With an input signal of 10V 60Hz at 300uW, it supposedly produces an AC output of 600W!

Paramahansa Tetwari, Director of the Kaiga Project, the largest nuclear power plant in India, has been experimenting with an 'N-Machine' and claims 200-300% efficiency.

Some of these claims are fantastic and have led to conspiracy theories, and some are just plain intriguing. Are there any EA readers who are experimenting along these lines? (David Dorling, Buderim, Qld)

THIS MONTH'S WINNER!

Now there's an invitation. Of course I don't expect to be inundated with replies, as this sort of thing is usually beyond someone

mucking about in the home workshop, but it's good to raise this issue every now and then. After all, the oil and coal reserves can't last forever, and nuclear power is probably not the long term answer to our energy needs. So thank you David for your interesting letter, which hopefully might lead to a few more on a topic that must become more vital as the years progress.

EA website

As you probably know, we now have our own website. If you haven't paid it a visit, I suggest you do, as you'll find a lot of useful material on it. But just how far should we go with this site? This letter asks questions other readers might also want answered.

I have just visited your web page for the first time, and was quite impressed. Have you considered giving subscribers access to past issues over the web? Would it be possible to place these articles in, say Adobe PDF format so readers could download them at their leisure? I know you supply copies of old articles by mail, but this is not always convenient. Perhaps as an incentive to subscribe to EA, you could make this feature accessible via the web to those with a current membership, through a password arrangement. (Duncan Wilkie, Melbourne, Vic)

Fair questions, Duncan. The idea of making EA available in PDF format has been raised before, but frankly, if we are to remain in business, the answer probably has to be no. For a start, someone would have to scan in and turn our old articles into PDF format, and we simply don't have the resources to do this. Let's face it, too — if readers can download the magazine for free, they won't buy it, and there isn't really a practical way of extracting small amounts of money on a pay-per-view system.

As for a password/subscriber system, at this stage we probably don't have the resources to implement and maintain that either. But times do change, and we'll keep these comments in mind.

That's the first part of Duncan's letter. The next, which follows, is about batteries. Dare I try and answer it?

Batteries

As I said last month, the topics in this column are chosen by you, the readers. I've received a few 'battery' letters in the last month, so let's start with Duncan's, then move on to cover what is obviously a topic readers want information on.

I am looking for information on the different techniques for charging batteries. That is, lead-acid types need a different charging process to NiCad or NiMH types. A brief explanation of the popular types and their charging requirements would be really useful. I would also like to know more about the differences between deep cycle and standard lead-acid batteries.

I know the difference in their application, but not their charging methods. I have heard that deep cycle batteries need to be charged at a slightly higher voltage than normal lead-acid types. I have also seen books which explain all this, but they are expensive and go into more detail than you need. (Duncan Wilkie)

Perhaps the easiest way to deal with deep cycle batteries is to present the following letter, which I think answers your question on these batteries, Duncan.

Deep cycle batteries

This letter is actually in response to a question raised nearly a year ago by a reader (Mr Gebhardt), who was having difficulty charging a deep cycle caravan battery from the towing vehicle's charging system.

In regard to deep cycle batteries compared to conventional lead-acid types, there is a difference in charging them, which becomes apparent when both are charged from the same source, such as a car charging system.

As you know, a starting battery is capable of 100A or more for short bursts, whereas a deep cycle battery of the same amp-hour capacity cannot approach this rate of discharge, thus suggesting its internal resistance is significantly higher than for a starting battery. When both are connected to the same charging source, the current takes the path of least resistance. If you use a battery controller, you'll have difficulty getting the deep cycle battery to charge fully within a reasonable time.

As shown in Fig.1, the controller normally allows the car starter battery to recharge, then simply switches in the deep cycle battery. However, because R_d (internal resistance of the deep cycle battery) is greater than R_s (starter battery), the charge time for the deep cycle battery is huge.

However, another system could be used, as shown in Fig.2. By moving the regulator to sense the voltage from the deep cycle battery (V_d), you ensure the alternator output is not controlled by the starting battery voltage

Fig.1

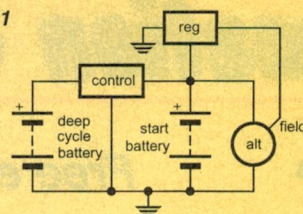


Fig.2

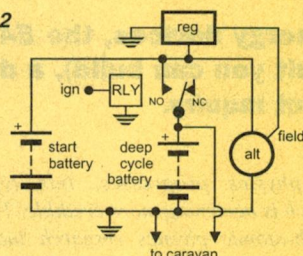
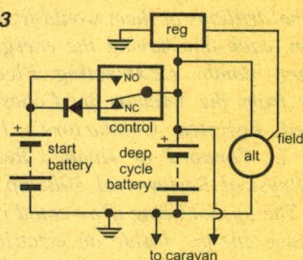


Fig.3



(Vs). By running the charging wire to the deep cycle battery first, a small amount of resistance is added between the two batteries. This plus the internal resistance of the deep cycle battery prevents it discharging a large current when the starter motor is operated.

Another possible system is in Fig.3. Instead of the controller keeping the starting battery in circuit all the time, and then connecting the deep cycle battery once the former is charged, work it the other way around. That is, the deep cycle battery is in circuit all the time, but while it is coming up to charge, the starting battery is connected through a small resistance (a diode plus extra resistance if needed), thereby giving the deep cycle battery a higher charge voltage. Once the deep cycle battery is charged, the controller switches the starter battery into circuit, but without the series resistance. These solutions are not ideal of course, but they might give readers some ideas. (Stephen Butcher, Masterton, NZ)

Thanks for these ideas, Stephen. As you've pointed out, a deep cycle battery is different to a conventional lead-acid battery, so having them across the same charging source causes problems. Charging one then the other, or arranging the charging circuit so the deep cycle battery is favoured both seem better methods. Now back to the first part of Duncan's letter.

Charging NiCads & lead-acid cells

Basically, a lead-acid cell is charged with a constant voltage source of around 2.5V per cell. At this voltage, the cell is almost fully charged, and its voltage then rises fairly sharply to around 2.7V. A lead-acid cell should not be discharged below 80% capacity, and ideally it should be kept fully charged during storage. However, the charging needs depend on the type of battery (gel, sealed, etc), so there are a variety of charging methods.

A NiCad (or NiMH) cell is normally charged with a constant current. The usual method is a 14-hour charge time at a current one tenth the ampere-hour capacity of the cell (or battery). So for a 500mAh NiCad pack, charge it for 14 hours at a constant current of 50mA. To keep it charged, use a trickle charge current of 5-10mA. There are fast charging methods that rely on sensing a temperature or voltage change in the battery, but I prefer the 14-hour charging system.

NiCads can be almost fully discharged during use, and stored in a discharged state. In fact, to reduce the memory effect (loss of capacity), a NiCad (or NiMH) cell should be discharged before charging it. Which leads me to the next letter, which is about deep cycling, a term that means automatically discharging a NiCad before charging it.

Deep cycling NiCads

I was recently reading an article on circuits for deep-cycling NiCads. I think it was an EA article, but I've checked your website and can't find any reference to it. Could you help me? (Greg Cutting, email)

I checked our database, Greg, and it seems the only article on this topic is a Deep-Cycle NiCad Battery Charger project published in March 1987. However, about a year ago I decided to build a universal NiCad charger, with a deep cycle facility which might interest you.

It has a number of interesting features, although I haven't shown them all. For instance it includes a digital voltmeter and ammeter, and a transformer tap changer to keep heat dissipation to a minimum. As shown in Fig.4, the circuit has a constant current source, based on an LM317 adjustable voltage regulator, a time clock (from a supermarket), and the deep-cycle circuit.

The constant current source has two variable resistors (VR2 and VR3), in which VR3 sets the charge current, and VR2 the trickle charge current. I ganged these pots to give one control, but separate pots are fine. I modified the time clock by removing the internal resistor in series with the motor, allowing it to operate from 30V AC. As well, it only needs to switch the contact off, not on and off as is usual.

So, in manual use, set SW1 to off, connect

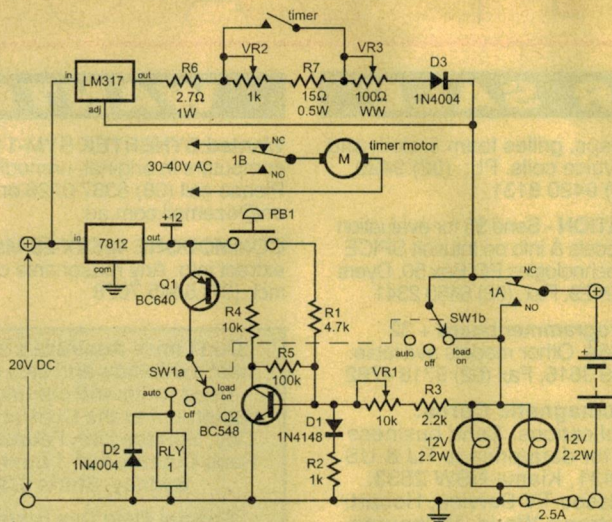


Fig.4

the battery being charged, adjust the charge and trickle charge current settings, set the timer to give a 14-hour delay, then turn the timer contacts on (closed). After the 14-hour time delay, the contacts open, putting VR2 and R7 in series with R6 and VR3, which reduces the charge current to the preset trickle current.

In deep-cycle mode, you set SW1 to auto, connect the battery, set the timer to a 14 hour delay, turn on the timer contacts, then press PB1. This causes RLY1 to energise, connecting the battery across the two lamps, which discharge the battery. The lamp ratings depend on the battery being discharged, so I fitted lamp sockets, allowing the lamps to be changed as needed.

When the battery voltage falls to around 0.8V (as set by VR1), Q2 turns off, turning off Q1 and the relay. When this happens, the timer motor starts, and the battery is connected to the charge circuit. After the 14-hour charge time, the cycle can be repeated by resetting the timer and pressing PB1.

I've used this device to successfully rejuvenate a range of NiCads. I built it on strip board, as there's not a lot of components.

12-ch UHF remote problem

Here's a letter seeking answers to a few problems with the 12-channel UHF remote system published in March 1993.

I recently assembled this project, and when testing the transmitter I found the LED wouldn't light. I checked the diodes and found D27 zapped. On replacing it, it burnt out again. Also, I notice that diodes D23-26 are S817

9541 types, not 1N4148s. Is this correct? Are capacitors C1, C2, C4 and C5 polarised, and should the 56-ohm resistor supplied in the kit be there? (E. Reichelt, East Keilor, Vic)

Diodes D23-26 are Schottky types, with a forward voltage drop of around 0.3V. These are used in lieu of 1N4148s to keep the supply voltage to the AX526 IC as high as possible. Otherwise, the supply voltage is too low compared to the data input voltage, causing erratic behaviour. Oatley Electronics (the kit designer) advises purchasers of this erratum.

Regarding D27 Mr Reichelt, there's obviously a considerable current flowing in, although it's difficult to tell where this current is coming from, as you say the LED doesn't light. As well, you must be using a substantial 9V source instead of a battery, as it takes quite a bit of current to blow a 1N4148.

To faultfind the circuit, use the 'half-split' technique, in which you divide the circuit into two halves. That is, isolate R6 and D27 from pin 17 of the IC, and check with a CRO or AC voltmeter that this pin produces an output when any key is pressed. In other words, get the encoding section working first.

When this section is working, try applying +5V or so to R6 (still isolated from pin 17) to see if the transmitter works, indicated by the LED lighting. When both halves are working, restore the circuit and confirm it works.

There are no polarised capacitors in the transmitter section, and the supplied 56-ohm resistor is not needed. Incidentally, this kit has sold by the thousands, with no one reporting this sort of problem, so it seems

you may have introduced either a soldering or component placement error.

What??

This month's question comes indirectly from my wife, who wanted to make a gadget she saw advertised in a magazine. It has two cubes with a cardinal number (0, 1, 2 ... 9) on each face. The cubes are manually arranged each day to show the current date, so for instance the first of the month is indicated by the cubes showing the numerals 01. The highest number of course is 31.

The question is: what cardinal numbers go on the faces of the two cubes? If you've seen this sort of device, you'll already know the answer. If not, trust me — it can be done!

Answer to January's What

The resistance between lines B and C is 1.25Ω. In fact, this is the resistance between any two X lines or any two Y lines. (X lines are lines 0 to 15, Y lines are A to P.) The resistance between lines 0 and A is 1.211Ω, which is also the resistance between any X and any Y line.

To solve the problem, I derived a simple equation to solve any matrix with an equal number of X and Y lines. The equation to find the resistance between any two X or any two Y lines is $2R/n$, where $n = 16$ for a 16 x 16 matrix. I didn't find a simple equation to find the resistance between an X and a Y line.

For an 8 x 8 matrix of 10Ω resistors, the resistance values are 2.5Ω (between any two X or any two Y lines) and 2.344Ω between any X and any Y line. ♦

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Win this great Contrib of the Month Prize!

As an added incentive for readers to contribute to this column, we're now offering a valuable prize to the question judged most interesting, or the answer/response judged most informative, each month. The prize is a Mod-Col 38/54 high-res PAL colour video camera module from sponsor Allthings Sales & Services, with 450 lines of resolution, built-in digital signal processing, electronic shutter and auto gain control — valued at over \$400!

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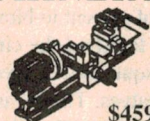
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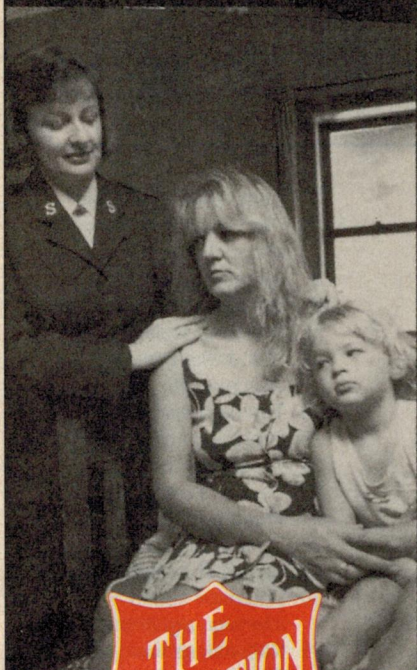
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UPGRADING AND REPAIRING PCs, by Scott Mueller (with Craig Zacker). Tenth Anniversary Edition, 1998, published by Que. Hard covers, 239 x 194mm, 1531 pages with two CD-ROMs. ISBN 0-7897-1636-4. RRP \$109.95.

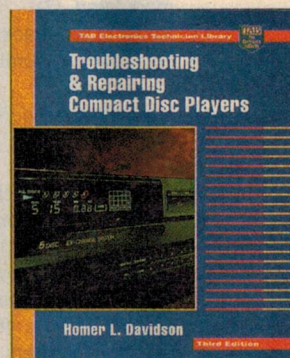
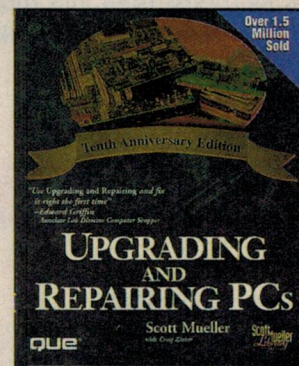
Boy — it seems no time at all since I was reviewing the fourth edition of Scott Mueller's classic reference on the 'nuts and bolts' of Intel-CPU based PCs, and here's a new and even bigger and better edition. I gather it's in effect the ninth edition, but in view of the book's phenomenal (and deserved) popularity, and the fact that Mr Mueller has coped with 10 full years of updating and revising, it has become the 10th anniversary edition.

On the cover it proudly proclaims that over 1.5 million copies have been sold, and I'm not surprised. If you've referred to any of the earlier editions, you'll know what to expect. Even more than before it's a positively HUGE compendium of solid, reliable information on almost every aspect of the hardware and firmware side of PCs. As you'd expect, too, it has also been updated and revised to cover as many recent developments as possible. The chapter on micro-processors has been given a major revamp, as have those on memory, motherboards and I/O interfaces. There's also a completely new chapter on printers, contributed by Craig Zacker.

There's now not just one, but *two* accompanying CD-ROMs, which include the text of both the fourth and sixth editions (to help ensure support of 'legacy' systems), video clips from Mr Mueller's teaching seminars, a technical specifications database and other resources from Micro House International, and useful shareware and demo versions of diagnostic software.

Overall, it's a massive source of technical information on PCs, and even more valuable than the previous editions. Scott Mueller and everyone else associated with the production is to be congratulated on the achievement. Quite simply, it's a resource that deserves a place in the armory of anyone who ever needs to troubleshoot, repair and/or upgrade PCs.

The review copy came from Prentice Hall of Australia, Locked Bag 507, Frenchs Forest 1640. Copies seem to be available in most major bookstores. (J.R.)



CD player repairs

TROUBLESHOOTING & REPAIRING COMPACT DISC PLAYERS, by Homer L. Davidson. Third Edition, published by McGraw-Hill, 1996. Soft cover, 186 x 234mm, 519 pages. ISBN 0-07-015762-6. RRP \$49.95.

As as this book points out, it's now often possible to repair a CD player without alignment jigs, even to the point of replacing the laser assembly. Of course there can be other problems, arising from their mechanical complexity and the difficulty of obtaining parts.

This large, well illustrated book deals with the complexity by explaining in good detail how a typical CD player works. It deals with real players, although being a

US publication some of the units described in the book might not be available in Australia. It also has lots of diagrams and photos to show how parts are handled, fitted or removed. On the downside, the reader is often advised to 'refer to the manufacturer's manual', so you can't assume it has all the answers.

The book integrates background information with servicing techniques, so you learn about the section you want to repair before being shown how to make the repairs. As you'd expect, the book deals with each part of a CD player separately. These include the laser pickup assembly, power supply, RF signal circuits, the servo system, motor drive circuits and the D-A and audio section. Portable, car and boom-box CD players are dealt with separately, as are remote control and display functions.

There's a wealth of information in the book, which alone makes it useful. It includes troubleshooting flow charts, waveforms, assembly diagrams, IC details and circuits, and discusses Mitsubishi, Pioneer, Realistic, Optimus, Denon, JVC, Onkyo, Panasonic and other brands of players. Many of the models discussed would be similar to those available here.

The review copy came from McGraw-Hill, PO Box 239, Roseville 2069. (P.P.) ♦

Electronics Australia is one of the longest-running technical magazines in the world. We started as *Wireless Weekly* in August 1922 and became *Radio and Hobbies in Australia* in April 1939. The title was changed to *Radio, Television and Hobbies* in February 1955 and finally, to *Electronics Australia* in April 1965. Here are some interesting items from past issues:

50 years ago

February 1949

Unit Construction in New FM Handie-Talkie: The new Motorola FM 'Handie Talkie' transmitter-receiver unit is designed for use by police, firefighters, public utility and construction workers, rescue and emergency teams and in other applications where a light weight, low power transmitter-receiver is required. Its 9.8 pounds include an 8-tube transmitter and 11-tube receiver, both crystal controlled.

The case is 10 inches high, 12-5/8 inches long and 3-1/8 inches wide. It is designed to be carried in the hand or strapped to the body. A handset clips into a cradle on top of the case when not in use. A 43-inch base-loaded whip antenna is standard equipment, but any 50-ohm antenna can be used to increase the range when the unit is used in fixed or semi-fixed locations.

The Handie-Talkie radio is available in two models. The FTHR-1AL and FTHR-1AH operate on any frequency in the 25 to 40Mc and 39 to 50Mc bands respectively. The units are tuned to the desired frequency at the factory. A unique cellular construction is used in the chassis. There are 19 cells, each housing a complete plug-in stage.

25 years ago

February 1974

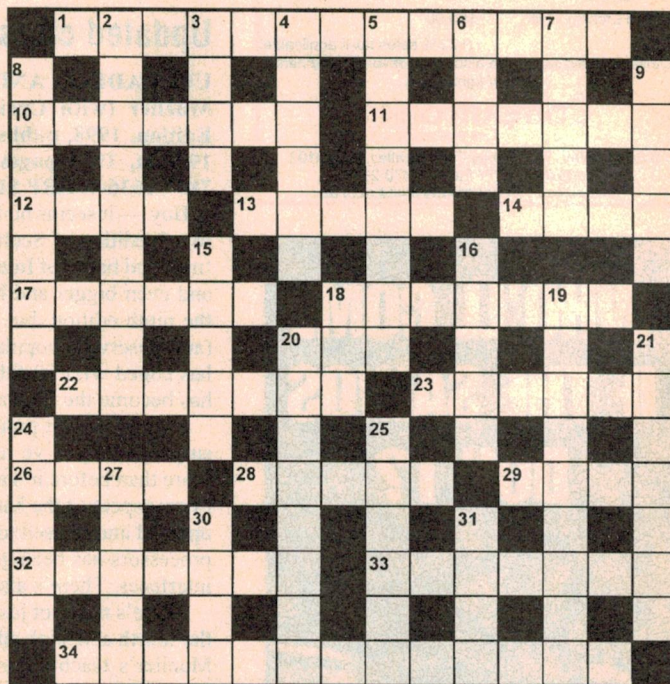
No Colour TV Before 1975: Colour television will not be generally available to Australian viewers before March 1, 1975. This has been confirmed by the Chairman of the Australian Broadcasting Control Board, Mr Myles Wright.

Mr Wright said that the Board felt it necessary to make this statement in the interests of viewers in view of recent speculation, which has received wide publicity, that colour transmissions might begin in July 1974. "Test transmissions in colour are already taking place, and many stations will shortly be working in colour within their studios, in order to prove equipment and train staff", he said. "However the Government's decision is that colour transmissions may not officially commence until March 1, 1975, and the Board will of course administer that decision."

Hand-held Colour TV Camera: A revolutionary hand-held colour TV camera, commissioned two years ago by CBS News and developed by Ikegami Tsushinki Company Ltd of Tokyo, is now in operation with the CBS Television Network at the CBS News Los Angeles Bureau. The new camera weighs only 121 pounds and provides broadcast quality pictures.

Incorporated in the new system is a compact portable videotape recorder made by International Video Corporation. ♦

Crossword

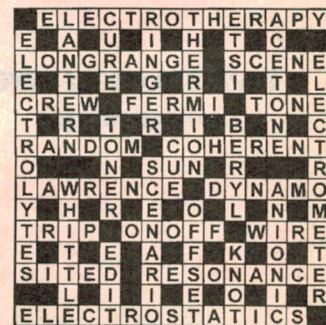


Across

- 1 Device allowing extra appliances. (6,7)
- 10 Type of barometer. (7)
- 11 Wave that becomes modulated. (7)
- 12 Noise of feedback. (4)
- 13 Determine mineral content. (5)
- 14 Navigational aid. (4)
- 17 Slowly changes frequency. (6)
- 18 Emanation of electrons. (4,3)
- 20 Cranial electrotherapy stimulation. (1,1,1)
- 22 Shaped like a helix. (7)
- 23 Said of radio wave of 30 to 300kHz. (6)
- 26 Laminating deters this current. (4)
- 28 Camera's adjustable setting. (1-4)
- 29 Summon by signal. (4)
- 32 Carry a current. (7)
- 33 Item of mechanisation. (7)
- 34 Standard audio signal at say 440Hz. (9,4)

- 5 Speaks into a note-taker. (8)
- 6 Prefix meaning fire. (4)
- 7 Major chemical group. (5)
- 8 Negative electrode. (7)
- 9 Deform for fastening. (5)
- 15 Remove insulation. (5)
- 16 Board with control switches, etc. (5)
- 18 Ten decibels. (3)
- 19 Impression of movement. (9)
- 20 Tape container. (8)
- 21 Electrical instrument. (7)
- 24 Workplace. (5)
- 25 Type of radiation. (6)
- 27 Nature of a black hole. (5)
- 30 Decrease sound intensity, significantly. (4)
- 31 National, as was James Clerk Maxwell. (4) ♦

January's solution:



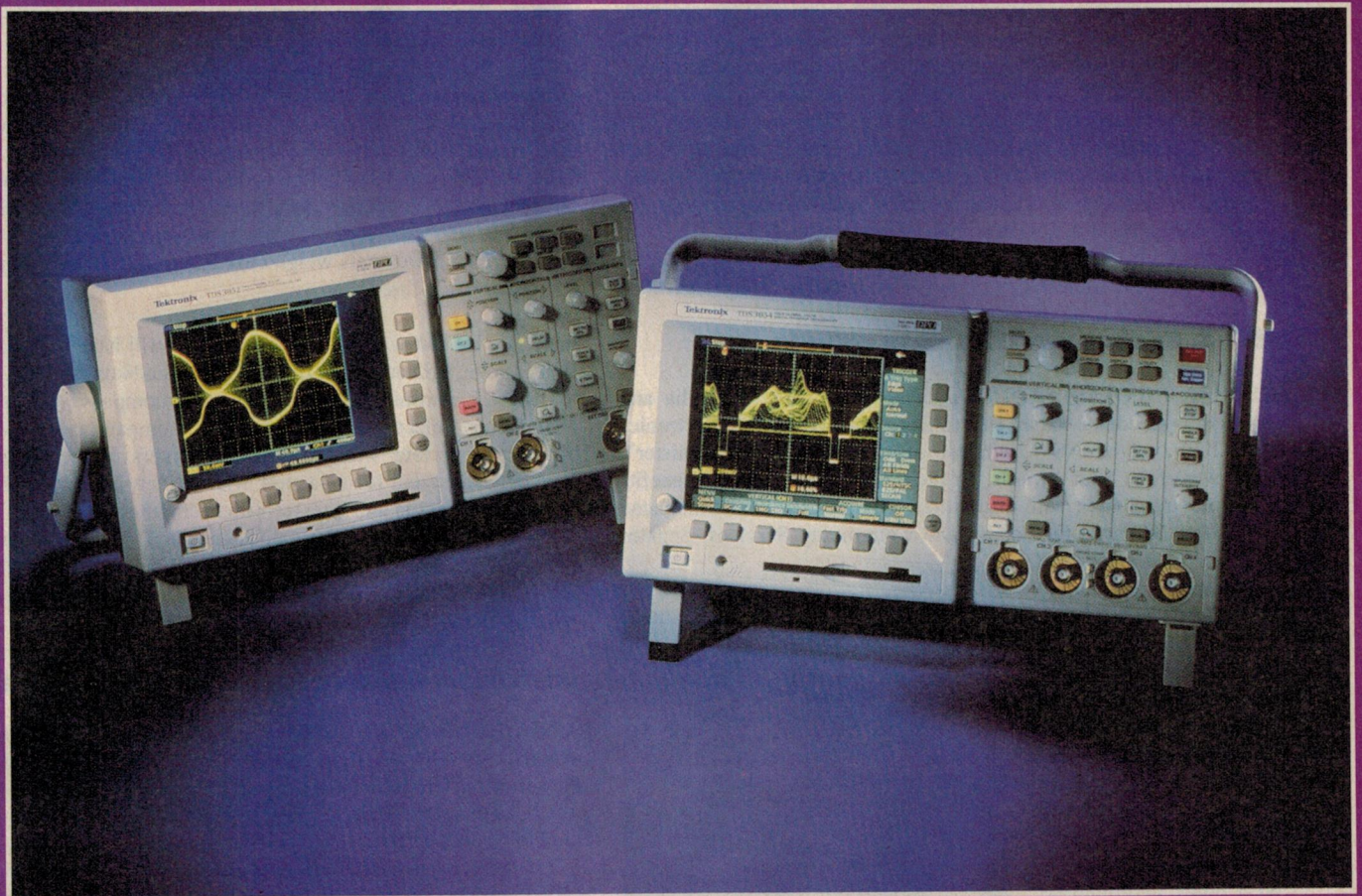
Electronics Australia's **Professional Electronics**

Hubble Space Telescope
finds thousands of 'hidden'
galaxies in southern sky

RCA returns to Australian
consumer market

IBM reveals improved
megapixel CCD sensor chips
for digital still cameras

Review of compact monitor
tester from Black Star



The new **Tektronix TDS3000** family of 'Digital Phosphor'
analog-feel-with-full-digital-functionality scopes: full colour
display, 2 x 100MHz up to 4 x 500MHz channels, battery
operated & compact — **with prices starting at only \$5385!**

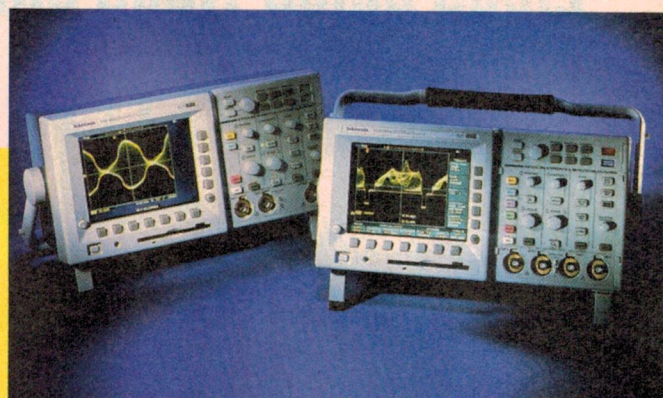
Highlights News

Tektronix reduces cost for its DPO technology

TEKTRONIX INC has introduced the second family of digital phosphor oscilloscopes (DPO), the TDS3000 family — promoted as 'the DPO for everyone', with prices starting at A\$5385 plus tax. There are six models in the new family, ranging from the TDS3012 with two 100MHz channels and 1.25GS/s sampling to the TDS3054 which offers four 500MHz channels and 5GS/s sampling. All six models offer a full-colour backlit LCD display and a built-in floppy disk drive, plus the ability to accept tiny optional plug-in 'application modules' which extend the scope's performance in specific areas such as advanced logic and pulse triggering, video line triggering or FFT spectrum analysis.

"Design engineers and manufacturing test technicians in communications, computer/peripherals and industrial electronics, will find that the TDS3000 models offer outstanding productivity enhancements", said Vince Ganley, VP of Tektronix' Asia Pacific Operations. "Service and repair professionals in the TV, video and telecommunications industries who use an analog oscilloscope because of its display qualities, can finally buy a replacement that is better than analog, and better than digital. Digital phosphor oscilloscopes provide the visual insight needed, now at a price everyone can afford."

Pioneered by Tektronix, DPOs display, store and analyze in real-time using three dimensions of signal information: amplitude, time



and the distribution of amplitude over time. This provides the intensity-graded display and responsiveness of an analog oscilloscope combined with the storage and measurement capabilities of a digital storage oscilloscope (DSO). Tek's first entrants into the DPO arena were the flagship TDS500D and the TDS700D family, each offering bandwidths from 500MHz to 2GHz.

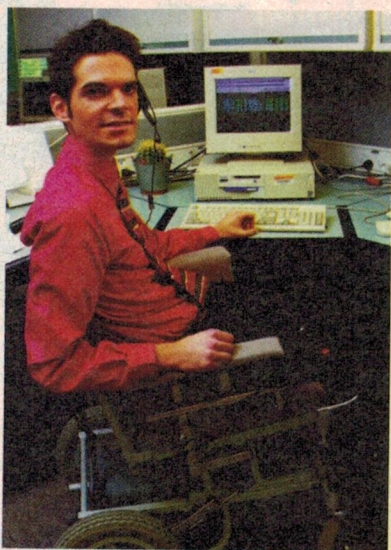
Other features of the new TDS3000 family include a built-in Centronics printer port with drivers for most popular printers, and a new 'QuickMenu' facility which allows very easy display and selection of functions and modes using the software-defined buttons along the right-hand and bottom sides of the screen. The scopes also offer the ability to operate from an optional battery pack, which fits inside the compact case — which measures only 375 x 176 x 149mm. The instruments weigh only 3.2kg without battery pack, or 5.2kg with pack fitted.

IBM & Benbro win disability awards

GLOBAL INFORMATION technology leader IBM Australia and Brookvale-based Australian electronics company Benbro Electronics were both judged NSW winners of the 1998 Prime Minister's Employer of the Year Awards, for their demonstration of the benefits of employing people with disabilities. The awards were announced by Federal Minister for Family and Community Services, Senator Jocelyn Newman, and recognise innovative Australian small and large businesses that have found it makes good business sense to employ people with disabilities.

IBM Australia, winner of the NSW Large Business Award, employs 20 people with disabilities, and has set up a range of initiatives to support these workers and to raise awareness of disability-related issues throughout the company.

"We are honoured that IBM's Diversity Program has been recognised through this award, but we also recognise



Carlo Teixeira of IBM Australia.

there is a lot that we and other companies still have to do", said Mr Bob Savage, MD and CEO of IBM Australia/New Zealand.

Benbro Electronics is a Brookvale based company that designs and manufactures electronic equipment. The company employs 16 people, including four with disabilities. Owners of the company are brothers Steven and John Bennett, who actively encourage all of their employees to assist and interact with each other.

"We believe we can make a difference and we do. We make a difference to our employees, our local community and Australia," said Mr Steven Bennett. Benbro Electronics was nominated for the Awards by CRS Australia and Shore Personnel.

Australian ISP offers fast satellite downlink

A NEW HIGH-SPEED satellite based home Internet service is now available in Australia from ISP The Internet Group. Called SatNet, the service offers Internet speeds up to 400kb/s, which is over seven times faster than standard 56kb/s modems. The first service of this kind to be offered here, it is available from as little as \$49 per month.

The service has been running in Auckland since 1997 (where it is called StarNet) and recently went nationwide in New Zealand, where it has been living up to all expectations of speed and reliability. The NZ service was reviewed by Bruce Simpson, editor of Internet publication Aardvark, who described it as "blindingly fast" and "unbelievable value for money."

Data is transmitted directly to users from PanAmSat's PAS2 satellite, which is in orbit over the Asia Pacific region. Users receive data via their own small satellite dish directly from the orbiting satellite.

Using SatNet is just like using a normal dial up account. Users dial up with their modem into one of The Internet Groups POP's in

Sydney, Melbourne or Brisbane. After logging in, the network will then route all incoming traffic through the dish with outgoing traffic going through the modem. Users can expect to see full-screen streaming media, better online gaming performance as well as very fast downloads and web browsing. The service also allows the transmission of e-mail and newsgroups to the user without the need to make a modem connection, using custom designed multicast software.

The Internet Group (IHUG) was formed in New Zealand in 1994 and opened their first Australian office in Sydney in early 1997. The group is a pioneer in using Internet satellite bandwidth technology, and has managed to split satellite transponder bandwidth into 64kb/s streams for resale to some of its 30 ISP customers. IHUG has over 120Mb/s of active bandwidth in service throughout the Australasian market.

More information on SatNet is available at its website (www.satnet.com.au) or by calling 1800 353 700.

Toshiba & Fujitsu linking for 1Gb DRAMs

JAPAN'S TOSHIBA Corporation and Fujitsu Limited have announced a major collaboration in the area of semiconductor memory devices, that will include development of 0.13-micron level technologies to achieve one-gigabit DRAM devices.

Under an agreement signed in December, a joint project team of approximately 100 researchers will be assembled at Toshiba's Advanced Microelectronics Centre in Yokohama to focus on development of ultra high-density 0.13µm process technology, device technologies, product design and prototype fabrication for 1Gb DRAM devices. The total project budget is projected to exceed 30 billion yen.

The Toshiba-Fujitsu collaboration comes amidst fierce competition in the memory market, which has been eroding prices and increasing the importance of cost-competitive development operations. In addition, development of 0.13µm process technology and other innovations needed to successfully achieve 1Gb-class DRAMs will require major technological breakthroughs. The collaboration will allow Fujitsu and Toshiba to effectively combine their R&D resources and complementary advanced semiconductor development skills, to accelerate development of key technologies and optimize overall development investment.

RCA returns to Aust consumer market

AFTER A BREAK of some years RCA, America's number one brand in TVs and VCRs, and a name world renowned for its cutting edge technology and innovation, is now available again in Australia.

Nowadays RCA is part of the giant Thomson Multimedia group that is currently the fourth largest consumer electronics company in the world, and seizing leadership in the emerging markets for digital and multimedia products. The brand is distributed in Australia by Thomson Consumer Electronics, which recently restructured its operation, streamlining sales activities and implementing new distribution arrangements to ensure business growth for the RCA brand in Australia.

Since its inception back in the early 1900s, the brand then known as Radio Corporation of America, has achieved many significant milestones. It began selling radio transmitting and receiving apparatus in 1921 and by 1930 was demonstrating television pictures on a

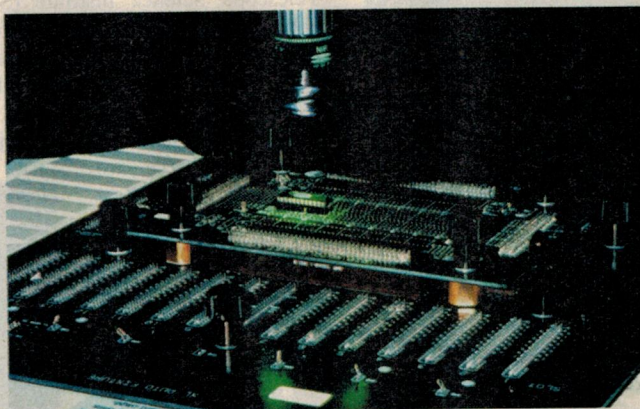
six-foot screen in New York. Credited with introducing television following World War II and developing the NTSC fully electronic colour TV system, the company produced its 100 millionth picture tube by 1976 and developed the first video camera and four-hour VCR machine along the way.

Today, RCA is playing a pioneering role in the development of interactive, digital and plasma televisions, DVD players and digital satellite systems. In Australia the company will be marketing a range of home theatre entertainment components.

RCA products will be sold in Australia through Vox stores and a series of electronics specialist stores around the country, such as Truscotts Hi-Fi in South Australia. This mass-market limited distribution policy is planned to allow the brand to achieve and maintain the premium presence it holds in other markets worldwide.

More information is available from the RCA web site (<http://www.tceaust.com.au>).

TDK gives demo of 4.7GB DVD-RW disc



Chip emission imaging specialist Hypervision has just released the PTF1, claimed as the first roll-up Emission Microscope for test heads to include zooming optics. (Hypervision Inc., URL www.hypervisioninc.com)

TDK CLAIMS that the era of home video recording on DVD discs has drawn closer as a result of its major breakthrough in phase-change recording material, critical to the development of a rewritable DVD disc capable of playback on DVD-Video players and computer DVD-ROM drives.

At technology seminars hosted by the company in the USA, TDK has demonstrated working prototypes of a 4.7GB DVD-RW disc using the company's new ReCom (Rewritable/Compatible) recording material. The disc, which was recorded in the company's research laboratory, displayed high-quality video programming when played on a variety of consumer DVD-Video decks.

According to Dennis O'Sullivan, TDK's General Manager, Sales and Marketing in Australia, the new ReCom recording material will prove critical in the creation of compatible/rewritable DVD-RW discs, as well as increasing the capacity of today's DVD-RAM discs from 2.6GB to 4.7GB (DVD-RAM discs are not playback-compatible with DVD-Video and DVD-ROM).

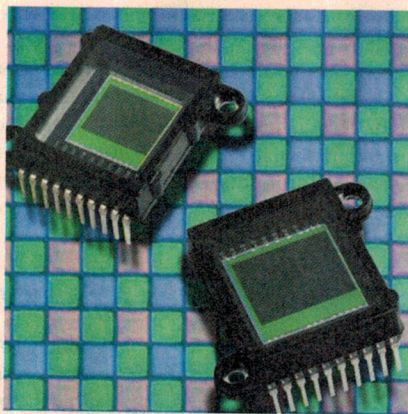
Compounded of silver, antimony, tellurium and indium, ReCom has the ability to form ultra-small, highly precise data marks in response to very rapid laser pulses. In addition, the material is extremely well-suited to multiple rewrite operations, and has been tested in excess of 1000 record/overwrite cycles.

TDK has also announced its success in creating a write-once DVD-R disc with a full 4.7GB capacity, up from the 3.95GB capacity of current DVD-R media. Write-once DVD-R discs are playback compatible with DVD-ROM and DVD-Video drives, and with 4.7GB capacity — the same as pressed read-only DVD discs — the new discs will be a more flexible and convenient medium for multimedia producers and DVD authoring professionals.

TDK has achieved 4.7GB capacity in its DVD-R discs by use of its proprietary MSI metal-stabilized cyanine dye technology, which was retuned for the shorter laser wavelength necessary for higher-density optical recording. The company, which pioneered in the development of cyanine-based recording materials for its line of Certified Plus CD-R discs, noted that other types of organic dyes currently used by some CD-R manufacturers do not have the properties necessary to create 4.7GB DVD-R discs.

Improved megapixel CCD camera chips from IBM

IBM'S MICROELECTRONICS division has developed new state-of-the-art CCD image sensors for use in consumer and professional digital still cameras, delivering up to 2.0 million pixels of image resolution while offering many performance and cost advantages over previous designs. IBM says its working with leading camera and lens design firms to incorporate the chips into complete production-ready digital camera designs.



Built using IBM's advanced 8" fabrication facilities using 0.5 - 0.35µm process technology, multiple polysilicon and metal levels, plus a fully planarised back-end metallisation process, the new chips use a 'full frame' design which enables a usable pixel area of 95% compared with the 50% typically achieved by previous 'interline' technology. They also eliminate the need for a microlens, as used by interline devices, which is subject to light scatter problems and adds additional complexity and lens costs.

Other advantages of the new sensors include a vertical anti-blooming design to effectively control localised overexposure, with no loss of active pixel area; state-of-the-art process techniques for extremely low dark currents (typically less than 100pA/cm²); use of a dyed-resist pastel colour filter which significantly improves light transmission; and a chemical mechanical polish (CMP) planarisation technique which yields very flat surfaces for colour filter application, thus greatly reducing light scatter.

The new IBM sensors are expected to reduce the production costs and improve time-to-market for camera manufacturers, making the benefits of digital still camera technology available to more potential users.

AT&T buys IBM's comms network

US TELCO giant AT&T has agreed to take over IBM's global communications network for US\$5 billion in cash. The operation provides services to hundreds of large companies around the world, tens of thousands of mid-sized businesses and more than one million individual Internet users in 59 countries.

As part of the deal, AT&T will provide most of IBM's voice and data services, and also use IBM for its own processing and data operations. The purchase should gross AT&T some US\$2.5 billion in additional revenue in the first full year of operation, according to analysts.

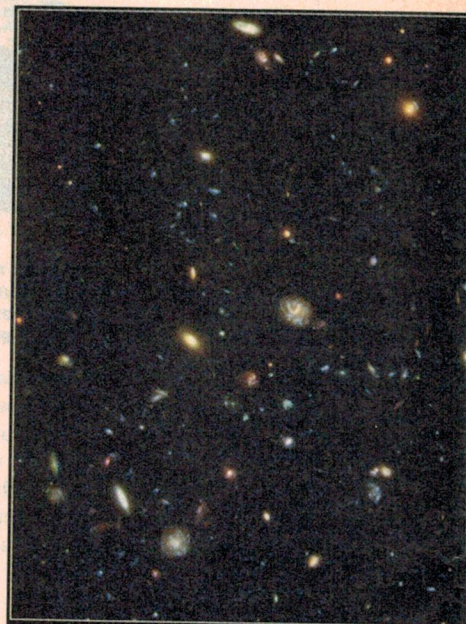
HST finds thousands of 'hidden' galaxies

TURNING ITS penetrating vision towards southern skies, NASA's Hubble Space Telescope (HST) has peered down a 12 billion light-year long corridor loaded with a dazzling assortment of thousands of never-before seen galaxies. The observation, called the Hubble Deep Field South (HDF-S), doubles the number of far-flung galaxies available to astronomers for deciphering the history of the universe.

This new 'far-look' complements the original Hubble 'deep field' taken in late 1995, when Hubble was aimed at a small patch of space near the Big Dipper. The new region is in the constellation Tucana, near the south celestial pole. The 10-day-long observation was carried out in October 1998 by a team of astronomers at the Space Telescope Science Institute (STScI), Baltimore, Maryland and NASA's Goddard Space Flight Center in Greenbelt MD. It was made available to the worldwide astronomy community for further research, and to the general public interested in the most distant reaches of the cosmos.

It will take months for astronomers to digest what new secrets of the universe are revealed by this latest look. At first glance the HDF-S appears to validate the common assumption that the universe should look largely the same in any direction. The two deep fields now give astronomers two 'core samples' of the universe for better understanding the history of the cosmos. It would take astronomers 900,000 years to use Hubble to survey the entire sky to the depths of the HDF.

All of Hubble's new cameras and other instruments were trained on the sky simultaneously for the observation. ♦



Hubble Deep Field South
PRC98-41a • STScI OPO • November 23, 1998
The HDF-S Team • NASA

IN BRIEF

- Sydney based professional audio and hifi component specialist **Audioworks** has become the Australian distributor for Luxman Electronics of Japan, in addition to its existing stable of high-end products from Meridian, KEF and Celestion from the UK, and Audioquest from the USA. The company also distributes Panamax surge protectors from the USA. Audioworks can be contacted on (02) 9428 4744.
- Logic control specialist **Procon Technology**, which is also the agents for fischertechnik, has moved; its new phone and fax numbers are (03) 9830 6288 and (03) 9830 6481

respectively. The postal address remains unchanged at PO Box 655, Mount Waverley 3149.

- Semiconductor distributor **GEC Electronics Division**, part of the worldwide Rexel S.A. group, has been appointed the Australian and New Zealand distributor for US-based Linear Technology Corporation, a market leader in the design and manufacture of high performance linear ICs using silicon-gate CMOS, BiCMOS, bipolar and complementary bipolar wafer process technology.
- Melbourne-based **Royston Electronics** has been appointed Australian distributor for Beautech

Inc, of Portland, Maine USA, which has released a new range of hand tools for microelectronic circuitry. These include miniature probes for chip testing, rework tools and tools for applying minute amounts of epoxy resin, etc. Literature and pricing is available from Royston on (03) 5981 0249, or fax (03) 9545 6797.

- Intel Australia has appointed TodayTech Wholesale (Aust) Pty Ltd to distribute Intel's processors and motherboards nationally through its offices in each state and key regional centres of Newcastle and Townsville. TodayTech Wholesale joins Synnex and TechPacific as one of Intel's distributors. ♦

Cooma's Fount of Service Manuals

To many snow skiing enthusiasts, the area around Cooma in the NSW Snowy Mountains is the place to go for winter sport. But to Australia's electronics service techs and enthusiasts, Cooma has a very different focus. It's the location of High Country Service Data, an excellent source for essential service manuals and other vital information...



“SERVICE MANUALS? How can you make money from Service Manuals?” This was just one of the questions that Stephen Rendell was asked in 1991 — when, after having owned and managed a reasonably successful television service business for 18 years, he decided to close up shop to rent service manuals out to other technicians.

The decision wasn't an easy one to make. Steve's eldest son Warwick had decided to leave school in 1989, at the end of Year 10, to join his father in the business. His middle son, Matthew, was also planning to leave school at the end of 1991 to join the business as well.

The idea was relatively untested and unproven. Many people in the electronics service industry questioned the wisdom of Steve's decision to close his doors on an 18-year career in electronics, to concentrate on the seemingly absurd notion of a service data rental library. Few people considered there to be a market for the supply of service manuals.

Steve had been lending service manuals from his library of about 3000 service manuals to various technician friends during the previous 18 months, at various rates, and for various periods of time. Eventually he settled on renting the manuals for a month at a time, for a fixed cost plus postage and packaging.

In September of 1991, Steve bit the bullet, and shut the doors of Moss Vale Vision and Sound forever. The first few weeks were fairly slow. A few phone calls here and there requesting this manual, or asking if they had that manual.

The only method of duplicating the manu-

als was a small Toshiba photocopier. It was getting an occasional workout, but nothing that pushed it too hard. Warwick answered the telephones, Matthew copied the manuals, Steve's wife Pam packed the manuals up and mailed them out, and Steve himself concentrated on writing the software to handle keeping track of the several dozen manuals being sent out each month.

By early 1992 it appeared that things were starting to get a little out of hand. Telephone calls had gone from a few per week, to several calls a day. Instead of sending out a several manuals each week, they were now sending out several manuals every day. The 1200 square foot shop, in which the electronics service business had fitted quite easily was now cramped — with boxes of manuals on shelves, in the hallway, all over the floor.

Having visited Cooma, in the New South Wales Snowy Mountains, more than a dozen times in the previous 12 months, the family made the decision to relocate the business from Moss Vale to Cooma. During Easter of 1992, Moss Vale Vision and Sound moved to Cooma, and with the move, its name was changed to High Country Service Data (HCS D).

In the intervening six and a half years, there have been many changes. HCS D now employs 14 staff, and has twice had to relocate to larger premises. The Toshiba copier has been replaced several times by increasingly larger copiers. HCS D has invested heavily in Océ printing equipment, with the production department consisting of two

high speed Océ copiers (producing 65 and 100 copies per minute respectively), and two Océ plan printers (for producing full size copies of fold-out circuit diagrams), as well as several Canon copiers.

HCS D now distributes manuals under warranty for companies such as Sony, Akai, Philips, St George, Hitachi, NEC, Samsung, and LG Electronics. As well, the company now sells instruction manuals for many consumer electronic devices straight to the customer. The service data rental library now has more than 70,000 manuals referenced, and these manuals are available for loan to technicians throughout Australia and the South Pacific basin.

As Steve Rendell and his family are happy to admit, they've come a long way since that fateful decision back in 1991 to specialise in renting service manuals. And they've built a very valuable resource, for the service technicians of Australia and their customers!

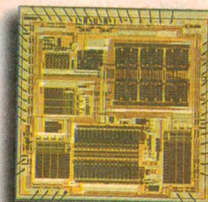
You can contact the team at High Country Service Data by phone, fax and e-mail — or visit their website. See our data panel for full contact details. ♦

Contact details

High Country Service Data
'LongHouse', Polo Flat Road
(Private Mailbag #3)
Cooma NSW 2630
Phone (02) 6452 5322
Fax (02) 6452 5301
Email: contact@hcsd.com.au
Website: <http://www.hcsd.com.au>

Solid State *Update*

Keeping you informed on the latest developments in semiconductor technology

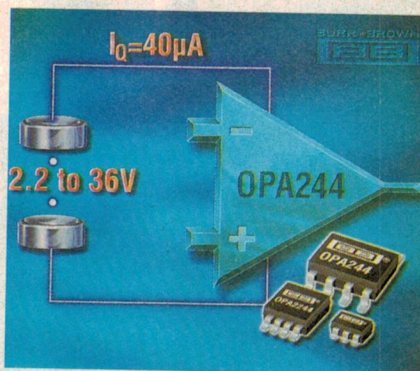


Miniature op-amps feature micro power

Burr-Brown's new OPA244 series of operational amplifiers features micro-power operation (40uA/amp), wide power supply range and miniature packaging. This makes them suited for battery-powered and space-limited applications such as portable computers, PCMCIA cards, battery packs, and portable test and instrumentation equipment.

The OPA244 series operates from single (+2.2V to +36V) or dual (+/-1.1V to +/-18V) supplies. It features an excellent speed/power ratio (240kHz/40uA) and offers low offset voltage (+/-700uV), high open-loop gain (106dB), and low input bias current (10nA). It is fully specified over the operating voltage range with key parameters also guaranteed over temperature for design flexibility. In addition, an input common-mode range that includes ground makes it ideal for single supply applications.

The amplifiers are stable in unity gain and excellent performance is maintained as they swing to their specified limits. A dual ver-



sion, OPA2244, is also available. Both versions — single and dual — are available in space-saving miniature SMT packages. The OPA244 is packaged in the tiny 5-lead SOT-23-5 while the OPA2244 (dual version) is packaged in the miniature MSOP-8 package. In addition, both versions come in standard 8-pin DIP and SO-8 SMT packages.

For more information circle 272 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

Controller IC, MOSFET for DC-DC converters

Vishay Siliconix has announced two new programmable duty cycle controller ICs and a 200V power MOSFET which together provide a compact, affordable converter solution for NT1, NT1+, ISDN and PBX distributed power applications, as well as DC-DC converter modules.

The new Si9118DY and Si9119DY PWM controller ICs allow forward and flyback converters to be implemented at frequencies up to 1MHz. Allowing input voltages ranging from 10V to 200V, the Si9118DY and Si9119DY operate at constant frequency mode during full load conditions, and automatically switch to pulse-skipping mode under light loads to maintain high efficiency throughout the full load range.

Both devices feature programmable duty cycle control, allowing up to 80% duty cycles at a 1MHz switching frequency. Thus in applications where wide input voltage and load conditions need duty cycles above 50%, the converters can be configured to provide

Low power 10-12 bit ADCs

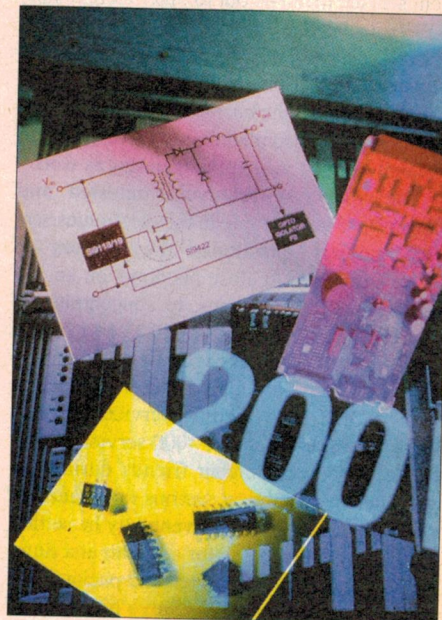
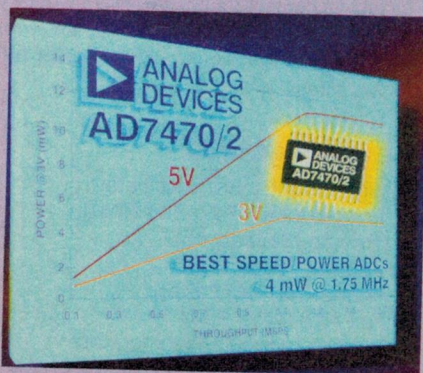
The new Analog Devices 10-bit AD7470 and the 12-bit AD7472 low power analog-to-digital converters (ADCs) are claimed to offer a 10 times improvement in throughput-per-unit power over competitive models. The high-speed, successive-approximation ADCs operate from a single 2.7 - 5.25V power supply and feature throughput rates up to 1.75MS/s for the AD7470 and 1.5MS/s for the AD7472.

The devices use advanced design tech-

niques to achieve these throughput rates while maintaining very low power dissipation. Operating at 1.5MS/s, the 12-bit AD7472 typically consumes only 1mA from a single 3V power supply and 1.8mA from a single 5V power supply. Power can be further reduced in lower throughput rate applications by invoking power save modes or lowering the clock rate. For example at 500ks/s, the devices typically consume only 0.5mA of current from a 3V supply or 0.8mA from a 5V supply.

The parts also contain a low-noise, wide-bandwidth track/hold amplifier which will handle input frequencies in excess of 1MHz and sustain 70dB SNR at 500kHz. Full-power bandwidth is in excess of 20MHz. Unlike most ADCs above 1MHz, the AD7470 and AD7472 incur no pipeline delays by employing a standard successive-approximation ADC with accurate control of the sampling instant via a CONVST (conversion start) input and 'once off' conversion control.

For more information circle 271 on the reader service card or contact Analog Devices, Suite 4/1621 Point Nepean Road, West Rosebud 3940.



optimal efficiency, while reducing the complexity of the transformer design.

Completing the active components needed for a total solution, the new Si9422DY Little Foot power MOSFET combines a

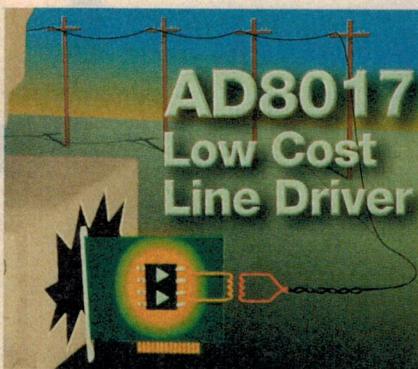
200V breakdown voltage with the lowest on-resistance ever offered for this device type in an SO-8 package: 420 milliohms. In many cases, the Si9422DY will allow designers to replace a DPAK or TO-220, simplifying PC board layout and streamlining the assembly process.

In addition to offering low on-resistance, the Si9422DY has been optimized for PWM applications with a typical gate charge of just 13nC, less than half the level of competing devices.

For more information circle 273 on the reader service card or contact distributor Braemac, 1/59-61 Burrows Road, Alexandria 2015.

Driver amp for xDSL applications

Analog Devices has announced the AD8017, a lowcost, dual high-output current low-power amplifier capable of driving low-distortion signals to within 1.0V of the +12V supply rail. The device was designed for driver amplifier use in single +12V supply xDSL



(digital subscriber line) systems such as PC-based ADSL, HDSL and xDSL modems.

The AD8017 drives a minimum of 270mA of output current per amplifier while maintaining -58dBc SFDR (spurious free dynamic range) at 1MHz into 10Ω, which ADI claims sets the standard for useable output current drive. Fabricated on the company's high-speed XFCB process, the high-bandwidth (160MHz -3dB BW), fast slew rate (1500V/us) and low noise (1.9nV/√Hz) of the AD8017 keep distortion to a minimum while drawing a low quiescent current of typically just 7mA/amplifier.

This combination of low distortion, high-output voltage drive and high-output current drive is claimed to make the AD8017 well-suited for low cost Customer Premises End (CPE) equipment for ADSL, SDSL, VDSL and proprietary xDSL systems.

The AD8017 is fully specified for +/-2.5V and +/-6V supplies as well as a +12V supply. It uses ADI's proprietary 'Thermal Coastline' thermally enhanced SOIC package, and easily operates from a +12V supply without an external heatsink (other than a four-layer PCB).

32.7kHz TCXO is temp compensated

Dallas Semiconductor has announced an oscillator that meets the precision timekeeping requirements of large computer networks, financial transaction processing applications and timed-access communications. A temperature-compensated crystal oscillator (TCXO), the DS32KHz meets the 1998 European network server recommendation for real-time clock (RTC) accuracy.

The new device provides accuracy as great as +/-1 minute per year (+/-2ppm) in operation from 0 to 40°C, making it the industry's most accurate 32.768kHz oscillator. The DS32KHz is an accurate, economical replacement for standard 32.768kHz crystals and oscillators. The TCXO's output can be used to drive the X1 input of most RTC chips, chipsets and other ICs that contain RTCs.

Inside the compact, surface mount package are a quartz crystal and a temperature-compensation IC. The compensation IC



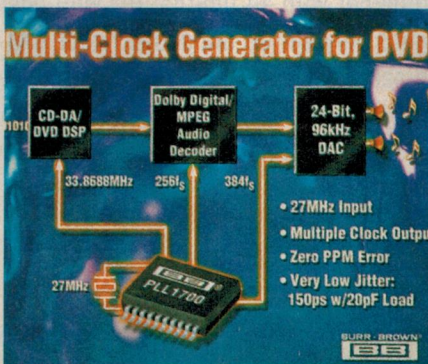
employs low current oscillator technology and Dallas' proprietary thermal-sensing technology. No external trimming capacitors are required, and no calibration is needed after the device leaves the factory. Patent protection for the compensation chip is pending.

For more information contact Dallas Semiconductor at 4401 S. Beltwood Parkway, Dallas TX 75244-3292

For more information circle 274 on the reader service card or contact Analog Devices, Suite 4/1621 Point Nepean Road, West Rosebud 3940.

Multi-clock generator for DVD

Burr-Brown's new PLL1700 is a high performance low cost, multi-clock generator phase locked loop (PLL) used to synchronize audio and video clocks within DVD



(Digital Versatile Disc) systems.

It is important in systems containing both digital audio and digital video-DVD players, DVD add-on cards for multimedia PCs, digital HDTV (high definition television), broadcast applications, and set-top boxes, that the clock signals be properly synchronized. Without proper synchronization, the voice/picture correlation can be poor and very noticeable to the observer.

The PLL1700 achieves audio/video synchronization by accepting a 27MHz MPEG-2 video clock, from which it derives all of the audio clocks for the rest of the

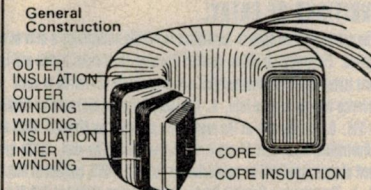
system. MPEG-2 (Moving Pictures Experts Group) systems require several clocks to control the surround sound AC-3 decoder, digital signal processor, and digital-to-analog converter(s). The device contains a high performance analog PLL with 150ps of clock jitter and zero PPM error, meaning that the output clock frequencies are extremely accurate.

In addition to synchronizing audio and video clocks, the PLL1700 eliminates external components previously needed in order to achieve this high level of performance.

For more information circle 275 on the reader service card or contact Nenelec, 2 Apollo Court, Blackburn 3130. ♦

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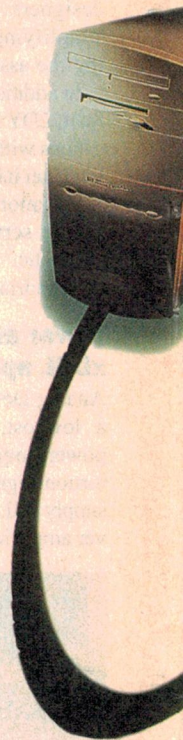


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HP's new Infinium family of oscilloscopes employ leading-edge technology to achieve outstanding levels of performance, combined with intuitive ease of use. They provide the very latest digital sampling, signal processing and display technology, together with an internal PC with customised Windows 95 graphical user interface. This allows you to not only set up the scope faster and more confidently than ever before, but also to save and recall both setups and measured waveforms — and also transfer them to your PC, for use in documents and reports. The inbuilt Windows GUI is mouse-driven and very intuitive, and even includes a full on-line, context sensitive help system — so there's no need for the traditional weighty user manual!

CONDITIONS OF ENTRY:

1. The competition is open to Australian residents authorising a new or renewed subscription to Electronics Australia magazine. Employees of IPMG, Hewlett Packard, their subsidiaries and families are not eligible to enter. 2. Prizes are not transferable or exchangeable and may not be converted to cash. 3. The judge's decision is final and no correspondence will be entered into. 4. The competition commences on October 12, 1998 and closes last mail on February 23, 1999. 5. The draw is at the promoter's premises on March 2, 1999 at 11 am and the winner will be announced in The Australian, issue date March 4, 1999, and notified by mail. In the event of any unclaimed or unwanted prize, a second chance draw will be conducted on June 23, 1999, subject of Reg. 37 of the Lottery & Gaming Regulations 1993 (SA). 6. The prize is a Hewlett Packard Oscilloscope valued at \$20,813 rrp. 7. Total prize value \$20,813 rrp. 8. The promoter is FPC Magazines, 180 Bourke Road, Alexandria, NSW 2015. 9. All entries become the property of FPC Magazines, and may be used for future marketing purposes. NSW permit No. TC98/7908; VIC permit No. 98/3623; ACT permit No. TP98/0953; SA permit No. 98/2955; NT permit No. NT98/2412.

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Photo shows four-channel model — prize is two-channel model

The PC inside Infinium oscilloscopes is based on an AMD K6 processor running at 200MHz and with 512KB of L2 cache, which allows waveforms to be updated at more than 1750 waveforms/second. It provides a waveform annotation feature (great for documentation), and along with standard I/O ports it even includes a 10Mb/s Ethernet port for LAN connectivity.

The HP 54810A Infinium Oscilloscope offers two vertical input channels, with a top sampling rate of 1GS/s and a maximum bandwidth of 500MHz, with 32K of memory depth per channel. It also offers an easy-to-drive 'analog like' front panel, plus a big and bright high-res LCD colour display screen. The controls are even colour coded to the channel traces, to minimise confusion. Setups can be easily saved and recalled from floppy disk, and the mouse-driven Windows GUI allow very intuitive 'drag and drop' operation for carrying out measurements.

In short, it's a truly superb instrument that would be a great asset to any home or professional lab — and it could be YOURS, if you're the lucky winner of our subscriptions draw!

New Products

Compact 3GHz counter

Aceco has released the low cost FC1001 3GHz frequency counter, claimed to allow exceptionally easy operation. All that is required is attaching the supplied telescopic antenna and turning the counter on; the eight digit liquid crystal display then shows the frequency of any transmitter within range.

The FC1001's 50Ω input amplifier can read a transmitter's output from 10MHz to 3GHz with 100Hz resolution. The only user control is a hold switch, to lock the display on brief transmissions.

The Aceco FC1001 is solidly constructed in a stamped aluminium case with a black anodised finish and is supplied with NiCad batteries that can operate the counter for six hours on a full charge.

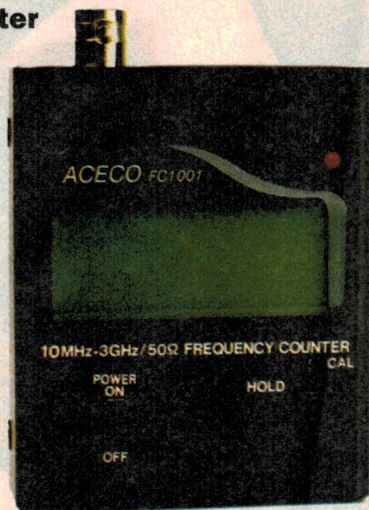
For more information circle 241 on the reader service card or contact Computronics Corporation, Locked Bag 20, Bentley Business Centre WA 6983.

Hybrid panel meters

Yokogawa Australia is now offering the model 2302 electronic analog/digital hybrid meter, providing OEM panel builders with high performance and a modern appearance at a low cost.

The meter features a bar graph display consisting of 31 segments for the range of 0-100% full scale. For improved readability, the scale graduation is always lit. The 2302 also features a colour liquid crystal display, that is back lit by a 12V/0.3A halogen lamp for long life, uniform colour and brightness.

The 3-1/2 digit display consists of seven segment, 8mm LEDs.



Accuracy is 0.25% of indication, plus one digit. Overrange functions and polarity indications are included as standard.

For more information circle 242 on the reader service card or contact Yokogawa Australia, Private Mail Bag 24, PO North Ryde 2113.

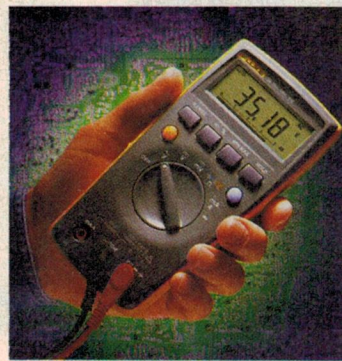


Lower cost DMMs from Fluke

Fluke Corporation has introduced two new rugged, reliable and affordable digital multimeters designed specifically for the Asia-Pacific electronics market. The new Fluke Model 17 and 19 DMMs offer key features for the electronic technician, such as Min/Max/Average Record that captures the lowest and highest readings for recording power supply drift, line voltage changes or circuit performance while temperature, load or some other parameter is being changed. In addition, the new DMMs have a wide AC voltage input bandwidth of 100kHz for accurate measurement of audio, video, monitors and switching power supplies.

The new meters also have a frequency counter for both voltage and current, to measure the frequency of a signal between 0.5Hz and 200kHz. They also feature autoranging that automatically selects the best range for a measurement and eliminates the need to turn the rotary switch to get the best reading.

The new Fluke DMMs are designed and manufactured to the latest safety standards of IEC 61010-1, 1000V Overvoltage Category I, 600V Overvoltage Category II.



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Both models and 19 have been submitted for independent testing and certification to CSA and UL standards. They are available through major electronics retailers.

For more information circle 243 on the reader service card or contact Philips Test & Measurement, 34 Waterloo Road, North Ryde 2113.

Power supply for cellphone testing

Responding to changing cellular-telephone designs and battery technologies, Hewlett-Packard has introduced its second-generation mobile communications programmable DC power source. The HP 66311A is a battery-replacement power source and 'measurement solution' designed to allow engineers to test any cellular telephone and charger functionality confidently.

Featuring a 5A peak current and 15 volts in a compact, half-rack package, the HP 66311A provides the DC sourcing necessary to test today's telephone technologies and the margin to prepare for testing tomorrow's. Two user-programmable compensation ranges ensure stable sourcing over a wide variety of wireless product input-capacitance and load-lead configurations. Excellent voltage transient response ensures maximum test-system throughput by minimizing device shutdowns.

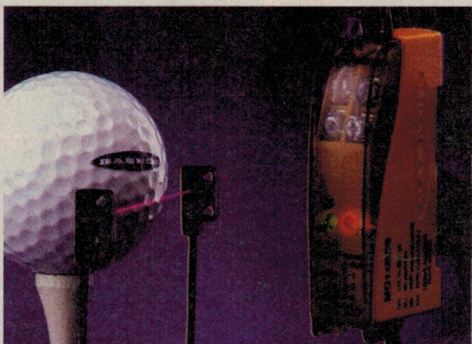
A combination of command-processing times of less than four microseconds and output-programming response times of less than 200µs achieves fast throughput. Totally linear topology also achieves output noise of less than 6mV peak-to-peak, ensuring lower overall test-system noise level and minimizing interference with sensitive radio frequency (RF) tests.

The HP 66311A also provides current-sinking of up to 2.8A for accurate testing of built-in battery chargers.

For more information circle 244 on the reader service card or contact HP's Test and Measurement Call Centre on 1800 629 485.

Tiny photo-electric sensing system

Banner Engineering Corporation has announced a new ultra-miniature, remote photo-electric sensing system. The Pico-Amp system consists of a modulated amplifier that clips to a



35mm DIN rail, and ultra-small diffuse (proximity) or opposed-mode, remote sensors that fit and function in the tightest locations. The system is claimed to be an excellent choice for wafer handling, small parts sensing, pharmaceuticals and other applications with space limitations.

The amplifier includes a four-position switch to select variable or three fixed modulation frequencies, plus Auto-Frequency mode, allowing multiple Pico-Amp sensors to be placed in close proximity, by filtering out the effects of optical 'crosstalk' through electronic circuitry. Other amplifier features include light or dark operation selection, sensitivity adjustment, and output Off-delay, allowing users to select no delay or a 50ms pulse stretcher useful in applications where a brief sensing event might be missed due to slow response of load or input.

The diminutive Pico-Amp sensors measure only 3 - 3.8mm by 7.9 - 11.7mm by 15mm.

For more information circle 245 on the reader service card or contact Micromax, 307 Keira Street, Wollongong 2500. ♦



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Monitor Tester, IR Thermometer

Test & measurement specialist Obiat has recently added two new instruments to its range — a compact Test Pattern Generator for checking and adjusting computer monitors, and a handheld Infra-Red Thermometer for non-contact temperature measurement, with built-in laser pointer to show the centre of its measurement cone.

by Jim Rowe

WITH PCs now being used in virtually every office, and also in many homes, there are huge numbers of video monitors in use as well. And needless to say, it's by no means unusual for those monitors to develop faults, or need adjustment. I've had a couple myself that developed intermittent faults of one kind or another, not long after I got them, quite apart from older ones that have needed adjustment...

When you do need to check out and/or adjust a monitor, a source of test patterns and other signals is very handy — if not essential. Although you can often generate such patterns using a suitable program running on the computer itself, this isn't always convenient. The computer may still be in use with a temporary replacement monitor, or the monitor may have been brought in for service without the computer.

True, a few TV pattern generators do provide the right output signals for testing monitors, but most don't. And while there are some dedicated pattern generators for monitors, they're generally pretty expensive. So Obiat's new portable MTPG, sourced from well-known UK manufacturer Black Star, should be of considerable interest.

It's very compact, being housed in a case measuring 150 x 105 x 40mm. At the same time it's quite rugged, as the case is based on a solid aluminium extrusion with securely attached end plates. A slide-out compartment for the 9V alkaline battery is fitted into one end, while the other provides a high-density DB15 connector for the video outputs, plus a concentric power connector to allow powering the generator from an external 7 - 10V DC (150mA) supply, instead of the internal battery.

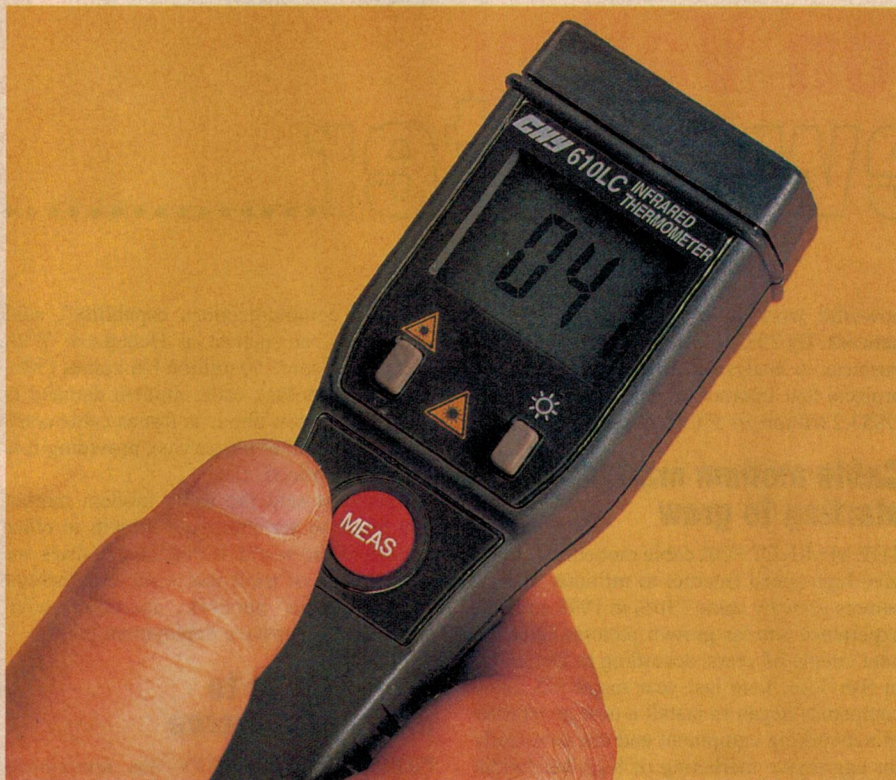
Operation is very straightforward, as on the top there's only three flush-mounted pushbutton controls. One is a Power On/Off; another a Mode switch which cycles between the generator's three available non-interlaced



Black Star's compact Monitor Test Pattern Generator, about 70% of actual size. Ruggedly built, it's capable of providing most of the signals needed to check computer monitors.

graphics modes: VGA (640 x 480, 31.5kHz/60Hz), SVGA (800 x 600, 35.3kHz/56Hz) or VESA (1024 x 768, 48.4kHz/60Hz). The centre Pattern button cycles through the generator's repertoire of

eight patterns: white screen, red purity, green purity, blue purity, black screen, colour bars, grey scale and crosshatch. LEDs mounted behind the panel give a clear indication of the graphics mode and pattern you've selected.



As you can see, the three graphics modes make the generator compatible with most monitors in current use, while the eight available patterns should be sufficient for the majority of adjustments and basic tests. The video signals are of the standard 0.7Vp/75Ω analog type, while the sync outputs use the standard TTL levels and polarities.

We tried the sample generator on a variety of monitors and it seemed to produce stable, clear patterns on just about all of them. The only one that didn't like it was a very old pre-analog video unit which expected wholly TTL signals.

In short, then, we found the Black Star MTPG a very practical little generator, which should be a handy accessory for anyone needing to check out, adjust or repair monitors. Our only misgiving is the price, which seems a little steep at \$598 plus sales tax — although this does include a carry case and mains power supply.

IR thermometer

The other interesting new product from Obiat is the CHY model 610LC infra-red digital thermometer, a very compact handheld unit designed to allow convenient non-contact temperature measurement at distances up to about two metres. Made in Taiwan, it has a built-in laser pointer to indicate the centre of its measurement cone, and can easily be operated in one hand — making it very suitable for measuring the temperature of equipment that is physically inaccessible for one reason or another (e.g., a high voltage transformer, or ceiling-

mounted airconditioning grilles).

The meter has a slim paddle-shaped construction, measuring 170 x 44 x 40mm and weighing a modest 160g including the four internal AAA batteries which power it. The indication is on a small LCD screen (27 x 20mm), with the temperature itself displayed in 12mm-high digits (3.5-digit format, in °C). Small icons above the numeric readout appear to show battery status, whether or not the laser pointer is enabled, and the display status.

There are again only three control buttons: one for enabling/disabling the laser pointer, one for enabling/disabling a backlight for the LCD screen, and the main 'Meas' button which you press to take a reading. Basically you just aim the front of the unit at the object whose temperature is to be measured, and press the Meas button for a few seconds — if necessary, using the laser's light spot to ensure that you're aiming correctly. Then you simply release the button, and read the measurement.

It's all very convenient, because the meter automatically 'holds' reading for about 15 seconds after you release the button. Then the meter simply turns itself off, to extend battery life. (If you have the laser pointer enabled, it functions only while you have the Meas button pressed, during the actual measurement.)

Measurements are taken at a nominal rate of 2.5/second, while the button is pressed. The IR sensor's response time is about one second, and its Fresnel optical system provides a spectral response of from 6 - 14μm approximately. The sensing cone has a diameter of around 40mm at half a metre, 65mm

The CHY 610LC infra-red thermometer shown in use, somewhat larger than actual size. It's very easy to operate, even with one hand.

at 1m and 115mm at 2m distance. The laser pointer's spot is typically less than 16mm diameter at 2m, so it gives a clear indication of the measurement focus.

The measurement range is rated from -20°C to 260°C, with a display resolution of 1°C and an accuracy of +/-3% of reading or +/-3°C, whichever is larger. This is in an ambient temperature range of 18 - 28°C. The meter is calibrated assuming a thermal emissivity of 0.95, which should cover most typical applications except those with highly polished surfaces.

We tried the sample meter to measure the temperature of a range of objects, at distances of a few centimetres to two metres — including a 33kV transformer (from outside its safety enclosure, of course!), some air-conditioning outlets and some humans. It turned out to be very easy to use, and seems to be an excellent tool for making fast and convenient temperature measurements.

At the quoted price of \$298 plus tax it probably won't take the place of mercury/alcohol pocket thermometers just yet, but for anyone who needs to make measurements of inaccessible objects or in awkward places, it would be a real bargain. ♦

Black Star Monitor Test Pattern Generator

A compact pattern generator for testing VGA, SVGA and VESA computer monitors

Good points: Compact and rugged construction, very easy to use. Good range of basic test patterns.

Bad points: The current price seems a bit high, reducing its appeal; hopefully the A\$/UK pound exchange rate might improve this in the future.

RRP: \$598 plus sales tax.

CHY 610LC IR Thermometer

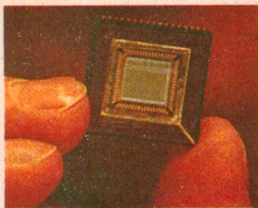
A compact, handheld IR thermometer for non-contact temperature sensing over distances of up to 2m.

Good points: Fast acting, very easy to use. Inbuilt laser pointer and automatic reading-hold function allows convenient one-hand measurement.

Bad points: Nothing, really.

RRP: \$298 plus sales tax.

Available: Obiat Pty Ltd, 129 Queen Street, Beaconsfield 2014. Phone (02) 9698 4111, fax (02) 9699 9170 (or visit their website at <http://www.obiat.com.au>)



Silicon Valley Newsletter.....

AOL-Netscape-Sun alliance builds 'giant killer'

THE US\$4.21 BILLION acquisition of browser market leader Netscape by America Online, the world's largest online service provider — in a three-way deal that also includes Sun Microsystems — is expected to create a superpower in the online market with combined sales of US\$3 billion and 11,000 workers. The deal with Sun also creates an alliance that has the technology and the desire to rival Microsoft's power in the computer market.

With Netscape, AOL acquires the most widely used Internet browser and will control two of the four most visited Web sites on the Internet. Together, Netscape's and AOL's sites reach a staggering 70% of all people who access the Internet, according to NetRatings, a research firm.

AOL's bid of US\$41.12-a-share for Netscape was more than double the price of Netscape's stock at the time, and a deal Netscape couldn't resist. "AOL provides more value than going at it alone", said Netscape CEO James Barksdale.

Netscape will continue as a subsidiary of AOL. Barksdale will retire from day to day operations but remain as an AOL board member. AOL's Chairman Steve Case said a key aspect of the merger is the ability for the combined company to leverage its combined Web power, sales and marketing operations to achieve a greater share of the online market.

The three-way deal takes direct aim at Microsoft. Sun Microsystems will distribute Netscape's business-level server software for three years in return for AOL distributing Sun's Java to its 14 million subscribers. AOL will offer Java for services on next-generation Internet devices such as handheld computers, organizers and mobile phones, which will tap the Internet. The market for those devices is expected to explode, and Sun's Chairman and CEO Scott McNealy wants Java to be the key software for it.

"You don't have to have a big, old Microsoft desktop to use AOL services", he explained, adding that he has sought a deal with AOL for a long time as he desperately wanted AOL to be a major force behind Java. "I've been calling on Steve Case for about four years. Every three to six months I would go knocking on his door."

Sun also will pay AOL more than \$350 million in licensing and marketing fees. In return, AOL will buy \$500 million of Sun's

powerful workstation computers to run its network. By 2003, Forrester Research, whose business is analyzing trends in cyberspace, projects that Internet commerce could reach US\$3.2 trillion, or 5% of all sales worldwide.

Cable modem market starting to grow

THE MARKET FOR cable modems that will give high-speed Internet to millions of consumers grew by some 130% in 1998 and will experience similar growth patterns over the next couple of years, according to Dataquest in San Jose. Late last year major US cable companies began to install a new generation of networking equipment and are now ready for aggressive marketing of high-bandwidth access to consumers.

Last year, some 492,000 cable modems were shipped, compared to 214,000 in 1997. That's expected to further increase to 2.4 million units a year in 2002. The US remains the driving force in the cable modem market, with a 79% global share now and slightly above 50% by 2002.

"In the residential marketplace, the success of high-speed cable data services will depend on the penetration of PCs in households as well as the state of network operators' cable hybrid-fibre-coax (HFC) infrastructure, and how much of it is activated for

two-way communications capability", said Patti Reali, an analyst at Dataquest. With PCs now in some 50 million US homes (50% of all households), cable modem demand is expected to grow about as fast as cable companies can deliver the service, providing it is reasonably priced.

Dataquest said the cable modem market will begin to see improved growth in other regions of the world. European countries are in the midst of trials and some commercial roll-outs, and network operators have announced aggressive deployment plans.

Clinton plan to help e-commerce

PRESIDENT CLINTON has announced plans to help boost security on the Internet, in an effort to help boost the already booming demand for electronic commerce services. Saying the Internet is the new "engine of global economic growth", Mr Clinton said the US government will take steps to protect consumers and businesses against cyber fraud. "We must give consumers the same protection in our virtual mall they now get at the shopping mall", he said, at a White House ceremony attended by executives from major e-commerce companies.

As part of the effort, the Clinton government will work with the Federal



One of the interesting new products unveiled at Comdex was this US\$500 'stand alone' flatbed scanner from Microtek. Called the ImageDeck, it sports both 3.5" floppy and 100MB Zip drives built in. These allow the user to scan in images and save them to either kind of disk, without interrupting software running on their PC...

Communications Commission and foreign trading partners to promote the development of faster Internet connections. "For many people, connections are so slow that shopping at the virtual mall is filled with frustration."

"If the virtual mall is to grow, we must help small businesses and families gain access to the same services at the same speed that big business enjoys. More needs to be done to build confidence among consumers that they can shop online with safeguards against being cheated. People should get what they pay for online; it should be easy to get redress if they don't."

Vice President Gore, who has been the driving force behind the Clinton Administration's high-tech policies, said the Internet enables a true global marketplace that is open to people from all countries. "In this emerging digital marketplace, nearly anyone with a good idea and a little software can set up shop and then become the corner store for an entire planet", Gore said.

Rise enters Intel market

FIRST THERE was AMD, then Cyrix, then IDT. Now another Silicon Valley chip company, Rise Technology of Santa Clara, announced at Comdex that it was getting into the Intel-compatible processor business.

Rise Technology unveiled its first mP6 processor, a chip that is aimed at low-cost PCs as well as at the market for TV set-top boxes, DVDs, and Windows terminals. The Rise mP6 chip sport speeds of 166MHz, 233MHz and 266MHz. The chips are available in either a 387-pin ball grid array (BGA) package for portables and a Socket 7 version for desktops.

The 266MHz mP6 is priced at US\$70 in 1000-unit quantities, while the 233MHz and 166MHz versions cost \$60 and \$50.

Meanwhile at the high end of the clone market, Advanced Micro Devices has launched its fastest K6-2 processor to date running at 400MHz. Compaq and other computer manufacturers said they would make new Presario models available using the AMD processor, which is priced at US\$283 in 1000-unit quantities.

AMD also announced that Acer Laboratories and Via Technologies have committed to developing chip sets for the company's next-generation K7 processor, which is targeted for release in the second quarter of 1999. The K7 will run at clock speeds of 500MHz and higher.

A.D. Little helps Samsung-LG chip merger

MERGER TALKS between two of the world's largest DRAM producers, Samsung and LG Semicon moved forward when the two companies agreed to let the Arthur D. Little consulting firm review the proposed merger of the firms' semiconductor operations. As part of the process, A.D. Little

brought in six corporate finance specialists and six semiconductor experts from the United States and Britain to make up a 15-member team.

The first discussions between Samsung and LG about merging their struggling chip operations started in September, but plans stalled as both chipmakers were reluctant to make concessions on management of the merged firm. If successful, the merger will help reduce global DRAM excess capacity. By combining their resources, the two parent companies will save hundreds of millions of dollars by avoiding R&D duplication.

Intel to use Andrea's DSDA technology

SPEECH RECOGNITION has been touted as the next must-have standard feature on personal computers in the next several years. Now Intel has announced an agreement with Andrea Electronics to incorporate Andrea's advanced 'Digital Super Directional Array (DSDA) far-field microphone' technology into its next generation of processors that will hit the market in 1999.

DSDA consists of a series of high-level software algorithms that provide active noise cancellation, echo cancellation, adaptive 'beam forming' and directional voice finding and tracking. The combined effect is said to result in superior quality voice input, even if the speaker is positioned at a distance away from the microphone.

The integration of DSDA into the Intel processor instruction set means the cost of adding advanced voice recognition capabilities to PC devices will be vastly reduced, enabling more users to take advantage of the technology and opening and accelerating new markets for third-party developers. Until now, voice recognition has generally required separate DSP processors, but these will no longer be needed.

Besides traditional voice recognition on a PC, new markets that may spring up around the new Intel chips, are the availability of PCs built into automobiles — with drivers performing a variety of tasks verbally that currently require keyboard/mouse input. Audio and video conferencing is also likely to take a leap forward, and cellular telephones will become hands-free.

Cadence lays off 12% of its workforce

CADENCE DESIGN Systems, the leading developer of IC design products and services, is laying off 560 workers, or 12% of its workforce. The move will save the company US\$60 million in fiscal 1999 operating expenses and will thus help the firm improve its earnings.

Cadence Chief Financial Officer Raymond Bingham said the changes will allow the company to focus on more profitable parts of its consulting business. ♦

Rent an iMac for US\$30 a month

APPLE COMPUTER is now making its chic new iMac computer available to consumers for just under US\$30 a month for five and a half years (15% interest). No payments are due for 120 days after signing up.

The program was aimed at luring first-time computer buyers into stores last Christmas, and allowing them to take the US\$1299 computer home at a price almost anyone could afford.

New PC users have comprised a surprisingly large percentage of the more than 300,000 iMacs Apple sold in the first two months. However iMac sales slowed down from 20,000 units a week initially to less than 9000 units in the third month (October).

"We want to turn on the turbochargers here", said Apple CEO Steve Jobs, adding that Apple was not planning to cut prices on the iMac.

Bill Gates opens new Web business

MICROSOFT CHIEF Bill Gates has opened a new business on the Internet, as Corbis, one of the companies he owns personally, began selling the first 1000 photographs and digital images over the Internet.

Corbis has secured rights to over 25 million photos and digital images that companies, publications and consumers can license. Some 1.4 million images are already available on CD-ROMs and other non-Web-based media.

The new store offers 16 combinations of five digital images, which consumers can license for US\$12 for use in Web pages, postcards or other non-commercial formats. They can also order images in hard copy format up to large poster sizes, and even framed for US\$16-80 per image.

Intel buys Web software developer

INTEL IS BUYING iCat, a developer of software used by small and mid-sized businesses to create Web-based 'storefronts' that allow for secure transaction processing. The purchase price for iCat, a privately-held firm, was not disclosed. Intel is using one of its subsidiaries to complete the transaction.

iCat was founded in 1993. It is based in Seattle and employs some 160 people. Clients of the firm include Volkswagen, Boeing, Hewlett-Packard and Ziff-Davis.

Sound Forge XP 4.0, and Cool Edit 96

If you're using a PC to prepare multimedia programs and presentations, or to transfer audio recordings onto CDs, you'll generally need a sound file editor. Here's a look at two of the most popular packages for the Windows platform: Sound Foundry's *Sound Forge XP 4.0*, and Syntrillium's *Cool Edit 96*.

by Jim Rowe

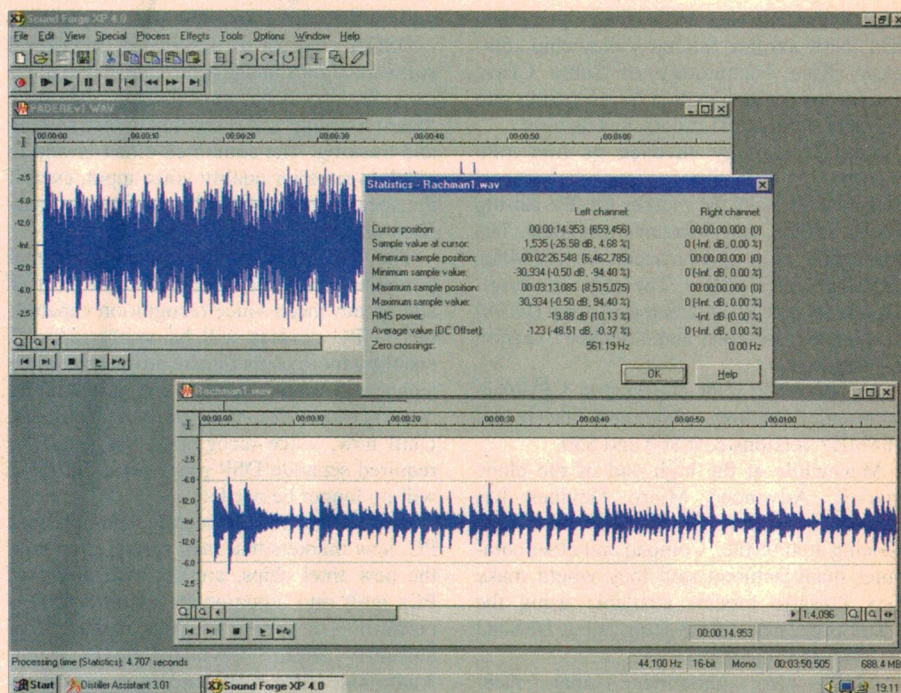
IN THE JANUARY issue, I reviewed two of the more specialised audio restoration packages. This time we're looking at two of the most attractively priced — and hence most popular — general packages for sound file editing and manipulation. One is Sound Forge XP 4.0, the 'lite' version of Sonic Foundry's very powerful Sound Forge 4.0a package; the other is Cool Edit 96, a shareware sound editing package from Syntrillium Software.

Both packages provide all of the facilities for basic digital stereo sound file recording, editing and manipulation, or replay on a modern PC running Windows and fitted with a suitable sound card. This makes them very suitable for preparing sound files for applications like making your own CDs or Mini Discs, multimedia programs and presentations, or streaming audio for 'broadcasting' on the web.

Sound Forge XP 4.0

US firm Sonic Foundry, based in Madison, Wisconsin has become well known in recent years for its powerful digital audio recording and editing tools — especially its full-bore Sound Forge package, which is one of the most popular editing suites for recording industry professionals. With the ability to record and handle virtually any digital audio file format known to humankind, perform drag-and-drop nonlinear file editing and accept a range of 'plugin' modules for all kinds of specialised 'industrial strength' tasks, the full Sound Forge package is often described as the audio equivalent of Adobe's Photoshop image editing package.

Of course not everyone needs this kind of power, nor can they necessarily justify the



Sound Forge XP can open multiple sound files at once, allowing drag-and-drop editing as well as cut/copy-pasting. It can also provide very detailed file stats information.

corresponding price tag (well over \$700). That's where Sound Forge XP comes in; it's essentially a 'lite' version of the full package, significantly lower in price (\$99) but still designed to handle all of the basic recording and file editing functions needed for mono or stereo sound files.

Incidentally the version of XP I've been able to try out is V4.0, but by the time you read this it will probably have been replaced by the even newer V4.5.

Sound Forge XP is still pretty powerful,

and capable of doing an awful lot of the audio editing and manipulation jobs that most of us are likely to need. It's compatible with Windows 3.1, 95/98, NT3.5 or later (there are both 16-bit and 32-bit versions on the distribution CD), and can record and play 8-bit or 16-bit mono or stereo audio, at sample rates from 2kHz to 96kHz — assuming your sound card will support the rate you want as well, of course.

It supports a wide range of digital audio file formats, too. Along with the familiar

WAV format it's also happy with a number of ADPCM formats, VOC, SND, VOX, PAT, AVI, SFR, RAW, RM (RealMedia) and ASF (advanced streaming format).

For recording, it provides accurate on-screen level meters to allow convenient adjustment and monitoring of signal level. Then once you have your audio file, there's the option of either editing it directly in Direct Mode, or indirectly via a working temporary copy. Direct Mode allows faster opening and saving, and is still quite 'safe' as XP maintains multiple undo buffers — so you can still undo any edits that turn out to be disastrous.

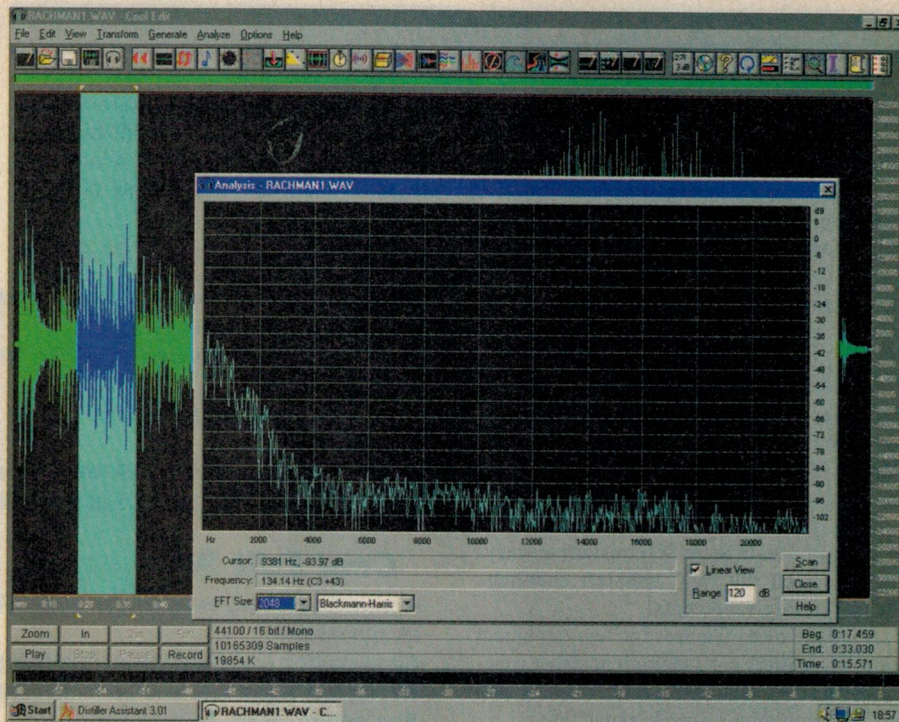
Moving or copying selected selections of a file into another file can be done by either a familiar Cut/Copy and Paste sequence, or by simply dragging and dropping between file windows. And this is a good example of the way Sound Forge generally provides a number of alternative ways to achieve many of its functions. Similarly to play a file or selected section, you can click on the main toolbar 'Play' button, click on a similar button provided on the 'Transport' toolbar of the file's own window, pull down the Special menu and go to the Transport dialog, or simply press the spacebar. It's up to you, and whatever you find convenient.

Among the impressive DSP functions available in XP there's Fade In/Out and Graphic (custom envelope fading); Insert Silence; Mute; Invert/Flip; Normalise; Volume adjust; Reverse; Pan between channels (L to R, R to L, Graphic control); Swap Channels; Resample (2kHz to 96kHz, with optional anti-aliasing filter); Time Compress/Expand; Smooth/Enhance (high-end cut or boost); and apply 10-band Graphic EQ. Then there are the Effects, which include Chorus; Delay/Echo; Reverb; Distortion; Dynamics Compress/Expand; Flange; Noise Gate (continuous noise filtering); and Pitch Bend (+/-24 semitones).

Another feature is the Tools menu, which allows you to generate DTMF or MF tones, or synthesise a variety of waveforms (sine, square, sawtooth, triangle, noise or 'absolute sine'), at any desired peak amplitude and frequency between 0.01Hz and 11.025kHz, or display the Statistics of a selected open file.

As you can see, it's pretty powerful. There are also nice features like the ability to quickly change the time-scale and amplitude-axis zoom levels, simply by clicking on buttons at the lower corners of the waveform window.

Using Sound Forge XP to manipulate some sample files, I found it to have a good balance between powerful features and ease of use. This should make it a good choice for anyone needing a flexible general purpose sound file editor. At the quoted price of \$99, it also seems good value for money.



Cool Edit 96 may be shareware, but it provides many powerful features — including a spectrum analysis tool, shown here, and a very flexible waveform generation facility.

Cool Edit 96

Based in Phoenix, Arizona, Synttrillium Software Corporation still seems to be fairly small, but the shareware versions of its Cool Edit audio file editing program have become especially popular — partly because of their availability via the Web, and partly because of their capabilities. The company also sells a more powerful 'retail package' multitrack version called Cool Edit Pro, which comes on a CD and is fully supported.

There are basically two shareware versions of Cool Edit, version 1.53 for the Windows 3.1X and Cool Edit 96 for Win 95/98 and NT4 machines. Both offer much the same features and facilities, but the version I've been using and will talk about here is Cool Edit 96. Either can be downloaded from Synttrillium's web site (<http://www.synttrillium.com>), and all of the program's main features can be tried out (essentially 'two at a time, but not all at once') before you decide to register. Then when you register and pay the registration fee (US\$50), the company sends you a personalised 'key code' to allow use of all facilities simultaneously. It's all very civilised and reasonable, especially since you can also download a comprehensive Users Manual from the web site as well. This is the way shareware ought to be marketed!

The range of file formats supported by Cool Edit is again pretty broad, and

includes all of the main types such as WAV, ADPCM WAV, VOC, VOX, RAW, AIF, SAM and AU. It supports 8-bit and 16-bit files, mono and stereo, and virtually any sampling rate supported by your sound card. If you have the corresponding hard disk space, it can edit mono or stereo files of up to 1GB in size.

As before, you can use it to perform all of the basic audio recording, playing and editing functions. You can record from a CD or from virtually any audio signal fed to your sound card, and then perform functions like Cut/Copy/Paste editing, trimming to length, deletion of selected segments, amplitude normalising, gain adjustment, inversion, removal of any DC component, muting, insertion of silent passages and so on.

You can also do file reversing; convert to a different sampling rate; amplify/rescale a section of a file, or a complete file (by either a linear amount, or with a selectable profile); compress or expand the signal, to manipulate its dynamic range; apply effects such as Reverb, Echo, Delay, Flanger, Distortion and Envelope modulation; Time Stretch or Compress; apply a variety of DSP-based filters, or an 8-Band Quick Filter; or mix between the stereo channels. Most of these operations seem to operate directly on the file concerned, but there are three levels of 'undo' to provide protection against mishaps.

Multimedia Software

Other nice features include a Noise Reduction function, to achieve dynamic filtering of continuous noise and hum, etc; the ability to use a sound clip as a 'quarter note' sample, to create chords and music; and a very powerful facility for generating noise (white/pink/brown), silence and waveform files. The latter should be of special interest to *EA*'s more technical readers, because it allows you to generate files with all kinds of complex test signals. You can generate simple or complex waveforms (up to four harmonics) with various base waveforms, apply frequency or 'ring' (suppressed carrier) modulation — even generate stereo signals with a designated phase difference (constant or varying) between the right and left channels. It's surprisingly powerful.

Another nice feature for we technical types is an excellent spectrum analyser function, with a good choice of FFT filters and the ability to adjust sample range, etc.

Finally, there's also a special 'Wave' function, which allows you to produce cyclically varying (spacially) stereo files, for use in achieving different states of relaxation. The user manual has a special

section devoted to this function and its use, with a comprehensive bibliography.

In use, I found Cool Edit 96 a very easy program to use, and surprisingly powerful

in its capabilities for editing, analysing — and creating — audio files. So it too would make a good choice for general sound file editing, especially if you like the idea of 'try before you buy' shareware. And it'll be of special interest if you want to generate files with special test signals. ♦

Sound Forge XP 4.0

A powerful but reasonably priced 'lite' version of the well known Sound Forge digital audio file editing package.

Good points: Good range of editing and file manipulation functions, flexible and intuitive operation.

Bad points: Nothing significant.

RRP: \$99.00

Available: Moore Music, 219 Napier Street, Fitzroy 3065. Phone (03) 9419 0344, fax (03) 9417 6697 (website at <http://www.mooremusic.com.au>)

Cool Edit 96

A powerful yet easy to use digital audio file editing and generation package, available as shareware.

Good points: Low price, 'try before buying', provides good range of facilities for generating test signal files and performing spectral analysis of signals.

Bad points: Again, nothing significant.

RRP: US\$50 to register.

Available: Synttrillium Software Corporation, PO Box 60294, Phoenix, AZ 85082-0274. Phone +1 602 941 4327. (website at <http://www.synttrillium.com>)



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Modular surge protection system

Protecting a computer system in your office or home against damage by the most common kinds of electrical spikes and surges can be messy, calling for a number of different devices. The Panamax Max6 Allpath Protection Platform now available from Dick Smith Electronics simplifies the job, by allowing you to integrate the protection in a single unit designed for modular expansion.

by Jim Rowe

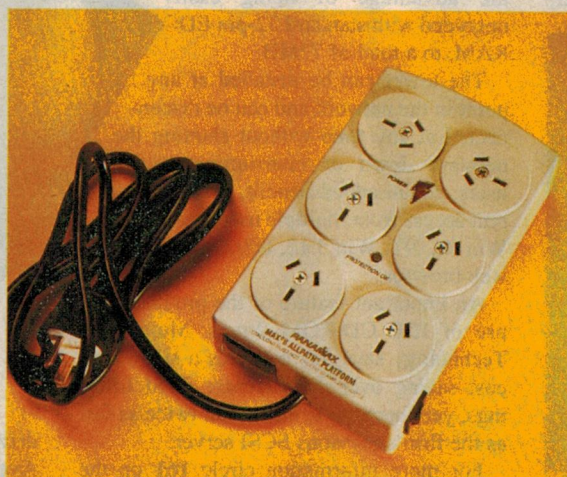
NO MATTER HOW good the mains spike and surge suppressor you have protecting your computer, if it's connected to the phone line via a modem there's still a chance that it can be damaged by spikes and surges arriving *that* way, during an electrical storm for example. Similarly if you have two or more computers connected together in a LAN, to share a printer or scanner, the LAN wiring itself provides another path for spikes and surges to be 'shared around' and cause damage.

If you have a TV tuner or radio card fitted into your PC, connected to an aerial, there's *another* possible path for damaging glitches to sneak in...

Of course surge/spike suppressors for mains power lines have been available for some time, and there's even been a few units for protecting things like modems, fax machines or other phone-line appliances. But strictly speaking, to protect a PC and modem combination properly you need to have the phone line suppressor connected to a good earth, and preferably the same earth used by the PC itself. This can be easier said than done, and the same applies with suppressors for a TV or HF radio antenna system cable.

It's these sorts of problems that the new Panamax Max 6 'AllPath Protection Platform' is designed to solve. It's essentially a modular expandable system, based on a compact but solidly made mains filter unit with six power outlets. To this can be clipped smaller expansion modules to provide protection for items like your modem and/or phone, a LAN connection, or an antenna system connected via co-axial cable. And when these additional modules clip on, they're automatically connected to mains earth via the mains filter unit. Very neat!

The Max6 AllPath Platform base unit itself has six outlets, as noted, with one nice feature immediately visible: two of the outlets 'face outwards', to accept plug-pack supplies without blocking the other outlets. Other nice features include two built-in LED indicators, one confirming Power and the other 'Protection OK'; a built-in 10A circuit breaker; and also a



built-in thermal cutout, to provide protection in the event of prolonged overload.

Inside this main unit there are no less than seven MOV (metal-oxide varistor) surge protection devices in addition to the usual choke coil and capacitor combination, to provide a high level of protection against both differential and common-mode spikes and surges. The rated single-pulse suppression capability is 1057 joules, with a response time of less than 1ns. The EMI/RFI noise filtering attenuation is rated at 50dB from 100kHz to well over 1MHz.

All filtering and surge suppression components are mounted on a sturdy PCB, along with the actual power outlets, and the lot fitted into a compact case (180 x 111 x 47mm) to ensure a high degree of reliability. The case appears to be made from ABS or similar plastic with high impact resistance, and is fitted with holes on the back to allow convenient wall or shelf mounting.

The key to the system's modular expansion capability is a bracket of springy metal attached to the top end of the PCB inside the case, and connected reliably to mains earth. The bracket is made accessible via a matching deep slot in the rear of the case, so that when an add-on expansion module is attached using a sturdy spring metal clip with a wide 'U' shape, this automatically makes contact with

the bracket to extend the protective earthing.

In fact each of the various expansion modules of the system is fitted with *two* similar deep slots on the rear, and they're clearly designed to be connected in 'daisy-chain' fashion. As each one is clipped on, it not only makes use of the protective earth but also makes it available for further modules. An elegant arrangement...

Made in the USA, the system is being exclusively distributed in Australia by Dick Smith Electronics. At present DSE seems to be bringing in only the Max Tel/1 Module, for protecting a phone/modem/fax line, but our understanding is that if there's

sufficient demand, they'll stock other modules as well.

The quoted price for the Max6 AllPath Protection Platform base unit is \$129, with the Max Tel/1 module a further \$39.95. These prices mean they're not the cheapest possible surge protection around, but still very attractive if you want a really neat and elegant way of protecting your expensive computer system investment. They're also very solidly made, and each one is rigorously tested by Panamax before they leave the factory. The company is also an internationally recognised designer and manufacturer of surge protection products, with over six million products in the field and 23 years' experience. ♦

Panamax Max6 AllPath

A powerline surge and spike suppressor designed for modular expansion to add protection for a modem, phone or fax, network interface, TV or radio tuner etc.

Good points: Rugged construction, designed for expansion. Built-in circuit breaker, status indicators & thermal cutout. 'Plug-pack friendly' sockets...

Bad points: Nothing significant.

RRP: Base unit \$129.00; Max Tel/1 modem/phone module \$39.95.

Available: Dick Smith Electronics stores, or ring DSE's Direct Link number 1300 366 644.

Computer

News & New Products

CD-ROM drive tower

Multimedia Technology has launched the latest addition to its ProKit range of products, the ProKit CD-ROM Tower. This is claimed to have several distinct points of difference from the usual CD-ROM Tower,



including eight 36x speed drives and a built in CD-ROM server to minimise loading on the network processor.

The ProKit CD Tower is a combined 10BaseT and 100BaseT solution that auto

switches to the required speed; there is no need to upgrade the server when an existing network changes from 10BaseT to 100BaseT. Delivered complete with 8MB of RAM memory, the unit has the advantage of being easily upgraded with standard 32-pin EDO RAM, to a total of 72MB.

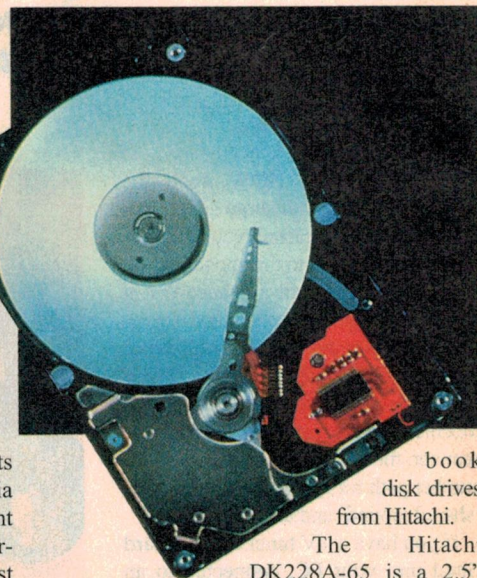
The tower can be installed at any point in the network and can be disconnected at any time without shutting the network down or interrupting network users. As an added benefit, it has concurrent access from multiple users via Win 95, Win 98, NT, Win 3.11, OS/2, Unix or any web browser.

An important feature of the product is its use of IDE CD-ROM drives. Multimedia Technology says this provides a significant cost saving over the alternate SCSI offerings, yet operation is more than twice as fast as the firm's previous SCSI server.

For more information circle 161 on the reader service card or contact Multimedia Technology, 335 Johnson Street, Collingwood 3066.

Tiny 6.5GB HDD for notebook PCs

Hitachi Australia has released their new 6.5 gigabyte disk drive designed for use in today's state-of-the-art notebook computers. The 2.5" drive represents the 8th Generation in a family of note-



book disk drives from Hitachi.

The Hitachi DK228A-65 is a 2.5"

drive with overall capacity of 6.490GB. Average seek time is 12ms, with a maximum data transfer rate of 33.3MB/s in Ultra DMA mode 2.

Overall weight is 130g and power consumption is rated at 0.85W. The drive has a 512KB buffer and a rotational speed of 4200rpm. It is available through Hitachi resellers at an RRP of \$965.

For more information circle 162 on the reader service card or contact Hitachi Australia, 13-15 Lyonpark Road, North Ryde 2113.

Free power supply design tools

Ericsson Components has released a new interactive CD designed to speed up the task of optimising power distribution architectures and selecting component power modules. The CD includes five easy to use interactive analysis tools to help engineers explore critical technical areas such as reliability and thermal design, as well as fine detail such as the trade-off between PCB track dimensions, current and voltage drop.

While full data on Ericsson's range of DC/DC power modules is included, the analysis tools are well suited to design tasks in any power system, especially when using distributed power. The CD provides a convenient power supply design tutorial, with a



comprehensive range of cross-referenced application notes, an interactive 'total cost of ownership' calculator and a power module selector which automatically recommends suitable solutions from the Ericsson product range in response to details of the performance required.

In addition to full details of Ericsson's modules, the multimedia package features video clips and animations to explain the options available to today's designers, making it suitable for engineers new to power system design, as well as more experienced engineers. Datasheets are included for the complete range, illustrated with full colour 3-D models which can be rotated in all three axes in real time to illustrate the details of the mechanical construction.

For more information contact your local Ericsson Components sales office.

Student edition of LabVIEW

National Instruments and Addison Wesley Longman have announced a new student version of the award-winning LabVIEW graphical programming software. The National Instruments LabVIEW Student Edition is a fully functional, easy-to-use software package that incorporates powerful new PC technologies featured in the latest release of LabVIEW 5.0.

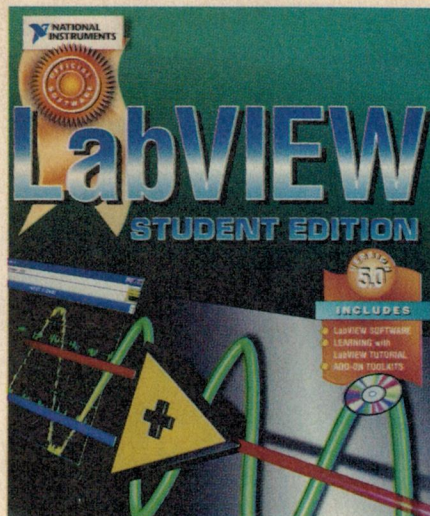
Engineering and science students can use the LabVIEW Student Edition in classrooms for analysis and simulation, or in laboratories to acquire experimental data. Students can design their own experiments, acquire data, perform analysis, test their hypotheses, and iterate as necessary. Furthermore, students with LabVIEW programming experience graduate with knowledge of the leading software package used in today's measurement and automation applications.

For more information circle 163 on the reader service card or contact National Instruments Australia, PO Box 466, Ringwood 3134.

PC-based soft logic controller

Priority Electronics has released a PC-based soft-logic controller with an IEC 1131-3 compliance run-time engine. The ADAM-5510/P31 controller provides 16-bit CPU, 512KB Flash ROM, 12KB battery backup SRAM, two RS-232 ports and a RS-485 port (MODBUS support) in a small and compact plastic package. Each ADAM-5510/P31 can handle up to four I/O modules (up to 64 I/O points.)

Targeted at traditional PLC (Programmable Logic Controller) users with a need for distributed control and changing processes, the ADAM-5510/P31 is claimed an ideal solution for applications such as



batch control, building automation and water/wasted water treatment. It offers the Advantech Paradym-31 run-time engine for the execution of standard IEC 1131-1 programs. Advantech Paradym-31 is an easy-to-use development workbench that provides three powerful graphic design languages based on the IEC 1131-3 standard for soft-logic configuration. Sequential Function Charts (SFC), Relay Ladder Logic (RLL) and Function Block Diagram (FBD) are used to define automation and control procedures.

For more information circle 164 on the reader service card or contact Priority Electronics, 189 Bay Road, Sandringham 3191.

Multimedia Lab for EE exploring

Edison Version 3 is a novel learning environment for electricity and electronics. Teachers and students can use multimedia screens, virtual instruments, sound and animation to create, test and safely repair cir-

cuits. Lifelike 3-D components are said to captivate the students as they build circuits and simultaneously see the corresponding circuit schematic. Edison also comes with over 100 experiments and problems that teachers and students can use immediately.

The package provides realistic virtual batteries, resistors, diodes, LEDs, transistors, logic gates, flip-flops, and even integrated circuits — all easily available on the shelves of your multimedia lab. Circuits are built by dragging them onto your 'breadboard' and wiring them together with your mouse. Your circuit begins working immediately so you can test and troubleshoot it with virtual instruments. In addition, Edison automatically prepares and displays a standard schematic diagram.

Edison's schematic editor and circuit analyzer are compatible with the more advanced TINA circuit analysis program, and Version 3 provides a state of the art analysis results window in addition to its virtual instruments.

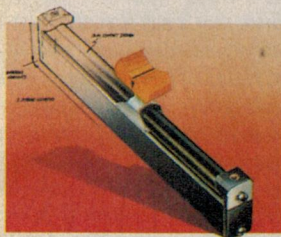
For more information circle 165 on the reader service card or contact Training & Technical Supplies, PO Box 289, Ingleburn 1890.

Easy & fast home video editing

Taiwan-based Ulead Systems has released their Windows 95/98 and Windows NT consumer video editing solution, Ulead VideoStudio 3.0. Aimed at the home market, VideoStudio brings digital video editing within the reach of any user with a camcorder, a PC and a video capture card.

To ensure that users are able to edit video successfully from their first session, VideoStudio includes a quick start module dubbed the Video Wizard. This program walks users through the steps needed to cap-

AUDIO-VIDEO



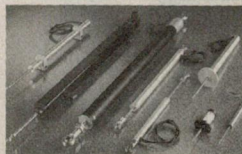
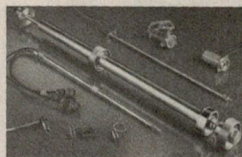
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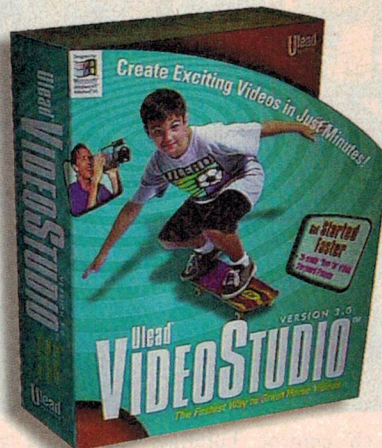
ture video, arrange clips and add professional enhancements to their video project. From the Video Wizard, users can choose to finish their project directly or to continue editing in VideoStudio itself.

The main program breaks down the video editing process into eight steps, from capturing video and adding effects to outputting the video as a finished movie. Program functionality is flexible so that as users learn and understand the video editing process, the program grows with them. For instance, both Storyboard and Timeline views are available for organizing clips, trimming and adding transitions. Users may start in Storyboard mode to become comfortable and then switch to Timeline mode for frame-accurate clip manipulation.

VideoStudio provides over 100 scene transitions with options for easy customization. Titles and credits are edited directly on-screen with quality guaranteed by built-in anti-aliasing and sub-pixel rendering. Voice-over narration can be recorded in real-time as the video plays back, dramatically simplifying the process.

VideoStudio is based on technology developed for Ulead's professional video editing solution MediaStudio Pro, recent winner of the digital video industry's prestigious DV Award of Excellence. In addition to input and output support for AVI and QuickTime video formats, VideoStudio provides MPEG-1 support. Native MPEG-1 editing increases video capture boards options, speeds editing performance and allows users to save their video to significantly smaller files.

Ulead VideoStudio 3.0 carries an RRP of \$199. For more information circle 166 on the



reader service card or contact Lako Vision, (03) 9852 7444.

New fast colour inkjet from HP

Hewlett-Packard's new HP 2000C Professional Series colour inkjet printer is claimed to deliver laser-class performance at personal-printer prices. The new printer has an estimated street price including sales tax of \$1532.

The HP 2000C produces documents fast, without compromising print quality. For typical desktop printing, it produces full-colour pages at up to five times the speed of the best-selling colour printer, putting it in the speed class of colour laser printers. Black print speeds are comparable to personal desktop monochrome laser printers.

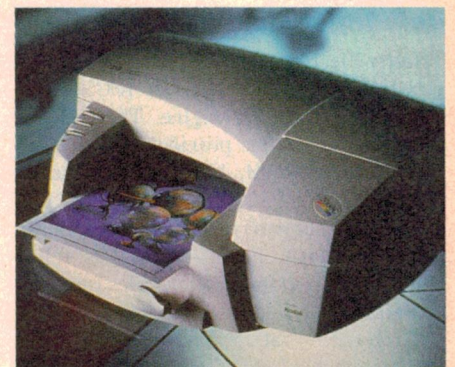
The printer uses HP's exclusive PhotoRet II technology for brilliant, photo-quality colour on any paper. In the HP 2000C printer, PhotoRet II delivers the smallest ink drops available (8 picolitres). The printer's

smart printing technology also delivers cost- and timesaving benefits. A modular ink delivery system's uses four separate long-life printheads and four separate ink cartridges, which are user-replaceable and inexpensive. Each component of the system has a 'smart chip' memory device to tell the printer when cartridges are low/out of ink and when to replace printheads. The information is displayed on-screen so users can check ink levels before printing — reducing the need to re-print, and minimising ink and media waste.

The HP 2000C printer features a robust duty cycle of 5000 pages per month — handling 60% more paper per month than previous HP Professional Series printers. It offers compatibility with Microsoft Windows NT 4.0, Windows 95/98 and 3.1x, and can be shared among several users with any HP JetDirect external print server.

HP also is offering the HP 2000CN printer which has an estimated street price including sales tax of \$2514, and comes network-ready out of the box.

For more information circle 167 on the



reader service card or call HP's customer service centre on 131 347 (no STD area code required). ♦

Fingerprint recognition for PCs

Digital Persona's UareU is a highly accurate fingerprint identification system for personal computers and the Internet, which provides convenient and foolproof data security with the touch of a finger. The system includes an elegantly designed computer mouse-sized scanning device with a USB connector, plus proprietary software that scans and digitises fingerprints, identifies authorised users and allows them quick access to the computer system.

The UareU scanning device sits unobtrusively next to the computer keyboard. When first used the software, which runs on Windows 95/98 or NT, asks for four scans of the user's fingerprint, displaying an image of

the print each time. The system then uses a set of proprietary algorithms to establish a fingerprint identification file unique to that user.

From then on, each time the system is accessed, the one or more approved users simply



touch the lighted scanning area. The device 'winks'

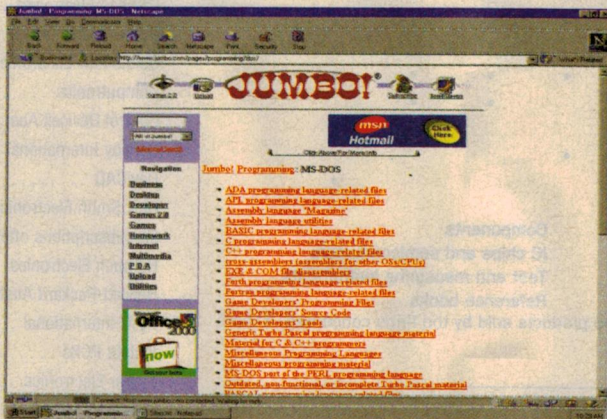
to let them know that it has scanned their fingerprint. The software then confirms that the scanned print is that of a legitimate user, and instantly allows access to the computer.

The system provides a second level of security by means of an application that adds fingerprint security to any screensaver. For users who have sensitive or confidential information on their systems and need to step away from their desks periodically throughout their work day, UareU automatically invokes the One Touch Screensaver. Only the legitimate user gets beyond it by quickly touching the sensor and having their identity verified.

Suggested retail price is \$469. For more information circle 160 on the reader service card or contact BJE Enterprises, 124 Rowe Street, Eastwood 2122.

by Graham Cattley

AS ITS NAME would suggest, the Jumbo! Downloading Network (<http://www.jumbo.com>) offers a huge number of file downloads in many categories, including screensavers, games, business software and just about anything else you can think of. Of interest to *EA* readers though, is the Programming Archive, which contains hundreds upon hundreds of utilities, source code and examples for just about all the major operating systems. Many thanks to Alister Huf for suggesting the URL.



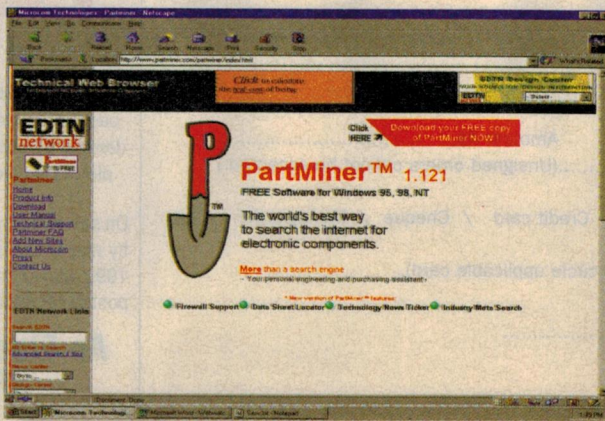
application that you can download and run, and it establishes a connection with the main database on the PartMiner site. You can then

IF YOU ARE interested in the many different forms of Dolby sound encoding, whether it be Dolby Digital/AC-3, Pro Logic or Surround, go and visit <http://www.dolby.com>, where they have articles on everything from the rather technical 'Parametric Bit Allocation in a Perceptual Audio Coder' through to a history of multichannel audio. Its all here in easy to download and view PDF form, and the many articles on offer mean that you should find something of interest.

Other pages cover DVD, Dolby and THX in cinemas, and a good introduction to noise reduction in cassette tapes. At first glance, this no-frills site looks a little dry and technical, but don't worry — its not, and is well worth exploring.

LOOKING FOR information on an IC or electronic component? Want to know who can supply it? If you've tried looking on the web for references to the part number, you'll know how frustrating it can be finding up to date details. Things get worse if you don't know who manufactures it, because you can spend days trawling everyone's sites looking for a match. If you are trying to track something down, try PartMiner — available at <http://www.partminer.com>.

PartMiner is a small



ing info, pricing, distributors and so on.

Although PartMiner is a stand-alone application, the search results are displayed on your browser, so you can jump directly to the site concerned. You also have the luxury of being able to search a number of sites at once, and you can even do all this in the background while you get on with other things. All up, I'd say that the idea works well, and would be a great help in tracking down that elusive component.

LAST MONTH I mentioned the Duncan Amps site (<http://www.duncanamps.simplenet.com>) suggested by *EA* reader Damian Corbett. Well, he's come up with a similar (if a little less flashy) site that goes by the name of Ampage. You'll find them at the suggestively named

<http://www.firebottle.com/ampage>, and they have quite a range of amplifier schematics available for download. There's data for a selection of valves, as well a link to the TDLS² valve data search engine hosted at the Duncan site.

Of course there's more to life than schematics and data sheets, and so be sure to check out the chat room and Tech-Talk BBS areas, as well as their humour page...

search over 200 suppliers, wholesalers, retailers and manufacturers for the part you are looking for, and you can be quite specific as to whether you want datasheets, order-

AFTER READING about a couple of MP3 sites I covered in this column last December, *EA* reader Richard Eves suggested I try <http://www.vqf.com> for info on the new VQF compressed sound format. VQF is similar to MP3 (Mpeg Layer 3), however it provides a compression ratio up to 30% higher than MP3. There's no free lunch though — playing a VQF file takes around twice as much processor overhead as a standard MP3 file, but with today's CPUs this shouldn't be a problem.

The site is surprisingly good, with lots of info on the VQF format, details of hardware VQF players and lots of downloads, including VQF players and even a VQF plugin for Winamp. Will this new format become as popular as MP3? Have a look through this site and see what you think. ♦

EA Directory of Suppliers

Which of our many advertisers are most likely to be able to sell you that special component, instrument, kit or tool? It's not always easy to decide, because they can't advertise all of their product lines each month. Also, some are wholesalers and don't sell to the public. The table below is published as a special service to EA readers, as a guide to the main products sold by our retail advertisers. For address information see the advertisements in this or other recent issues.

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KEY TO CODING

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Altronics	31, Insert
Amber Technology	IFC
Audioworks	21
AWA Audio Products	19
Campad Electronics	72
Codan (Queensland)	92
Colourview Electronics	34
Computronics	72
Control Devices Aust.	95
Convoy International	17
DaviCAD	72
Dick Smith Electronics	52-55
EA subscriptions offer	82
Harbuch Electronics	81
Hewlett-Packard Australia	82-83
Hy-Q International	92
Instant PCBs	72
Jaycar Electronics	38-41,72
Jamo Australia	0BC
JED Microprocessors	59
Kalex	12
ME Technologies	72
Microgram Computers	49
Netcraft Australia	65
Oatley Electronics	43,IBC
Obiat	85
Peter C. Lacey Services	65
Pioneer Electronics Australia	23
Robot.oz.com.au	67
Questronix	65,72
Scan Audio	12
Sony Australia	13
Speakerworks	48
Stantron Australia	84
Tandy Electronics	61
VAF Research	25

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by Peter Phillips

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On sale now at your newsagent for only \$5.95, or by mail order from EA Reader Services (PO Box 199, Alexandria 1435) for \$6.95 including postage and handling.

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IR RECEIVER FRONT END MODULE

Contains an IR receiver diode, amp tuned to 38KHz, a band-pass filter, an AGC section & detector circuit. \$2 Ea or 10 for \$15

WIRED IR REPEATER KIT: Ref: EA

March 96. Simple kit which uses a commercial IR Transmitter and a Rx kit which works with most remote controls. The receiver uses a receiving module to pick up the 40KHz IR signal. The output of the receiver module is connected to the IR LED driving circuit of the IR Tx. This retransmits, giving an extension in range of up to 15 metres: (K66R) \$20

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We have a new improved high power, swept ultrasonic generator kit that can drive up to 4 piezo tweeters. Works on dogs, most animals, rodents and possibly on some bugs etc. kit inc. PCB with all on-board components and a horn piezo tweeter: (K112) \$29 Additional Piezo Tweeters (AP1) \$4 ea (One is good, but up to four can be used) Suitable DC Plugpack: (PP12) \$10

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With strong universal swivel mount & 50X50X50mm housing: \$36 Just \$30 With any camera purchase

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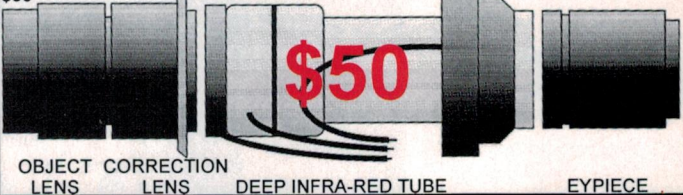
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OBJECT CORRECTION LENS LENS DEEP INFRA-RED TUBE EYEPiece

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Based on a low noise (2.8dB noise figure) & wide bandwidth (2GHz) amp IC (MAR-6), this kit can be used as an active TV antenna. The PCB is divided into two sections. The PCB can be cut so that the supply board can be indoors. The MAR-6 available separately \$4. The amplifier produces good results with any two metal wires or strips acting for the antenna. It should even work with a coathanger! Basic kit with both the PCBs & all on-board parts (K03) \$15 Basic Kit + 2 Weather-proof Plastic Boxes + plug-pack: \$24

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This could be used as an answering machine at your front door or as a personal reminder device. Good quality sound. Uses LSI chip with memory etc. built in. Kit includes PCB all on-board components, microphone, switches & speaker \$19 (K124)

ENCODER/DECODER CHIPS

As used in remote control devices AX532-6 encoder, AX532-7 decoder with 4 bit latched outputs, AX532-8 with Valid Data output. These chips could be used to control up to 16 items (relays etc.) down one wire all with brief application sheet: \$3.50 or combo. of any 10 for \$25

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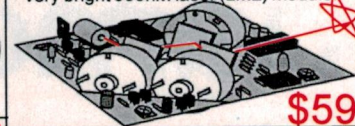
70mm HIGH 7 SEG. STANDARD TYPE DISPLAY. (no data available) JUST \$20 FOR 7 (D12)

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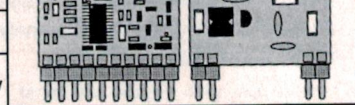
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With the above Tx and Rx kits you can add a motorised pot. / volume control to anything (K65V) \$16 This kit can also be purchased with the above two kits, an RCA & suitable Plugpack: (K65C) \$55

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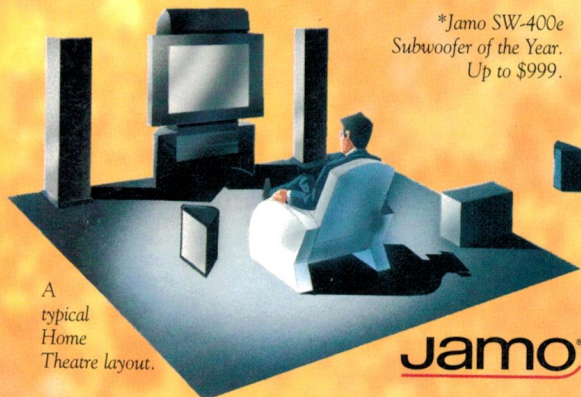
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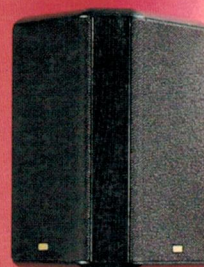
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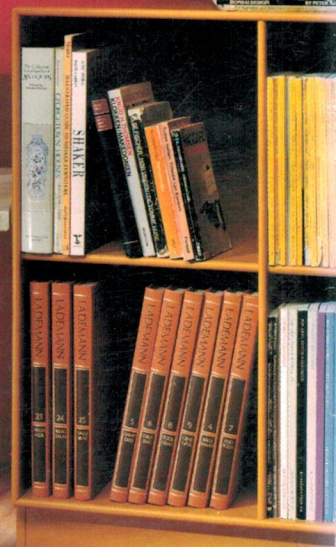
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